APPENDIX 13ARestoration Timeframe

Table of Contents

API	PENDIX 1	L3A RESTORATION TIMEFRAME	13A-1
1.0	NATUF	RAL RECOVERY EVALUATION	13A-2
1.2 1.3	. Enhan . Natura	ored Natural Recovery al Recovery Model: SMA-14	13A-2 13A-3
1.4	1.4.1.	ability of Natural Recovery Model to SMA-13	13A-6
2.0	1.4.3.	Summary	13A-7
3.0	BIOAC	CUMULATION COCS	13A-8
3.1	3.1.1.	COCs	13A-8
		Alternatives 1 through 7	13A-9
3.2	3.2.1. 3.2.2.	Chromium Restoration Timeframe Evaluation for Cleanup Action	13A-10
	3.2.3. 3.2.4.	Alternatives 1 through 7	8 13A-10 e,
4.0	SUMIN	IARY	
5.0	REFER	RENCES	13A-12

LIST OF TABLES

Table 13A-1. Benthic COCs: SMA-13 Enhanced Natural Recovery Evaluation

Table 13A-2. Bioaccumulation COCs: Estimation of ENR-Adjusted Surface Sediment Concentrations (SMA-13 and SMA-14)

LIST OF FIGURES

- Figure 13A -1. Areas Included in Restoration Timeframe Evaluation
- Figure 13A -2. Lake Zones
- Figure 13A -3. Observed Reduction in cPAH TEQ Concentrations in SMA-14 Surface Sediment over Time
- Figure 13A -4. Future Ratural Recovery in SMA-14 Surface Sediment, Sensitivity Analysis
- Figure 13A -5. Future Natural Recovery of Surface Sediment in SMA-14
- Figure 13A -6. Temporal cPAH TEQ Trends in Surface Sediment 1999-2005



APPENDIX 13A RESTORATION TIMEFRAME

The purpose of this appendix is to evaluate the restoration timeframe for the eight cleanup action alternatives identified for the sediment portion of the Gas Works Park Site (GWPS), which is referred to in the FS as the sediment cleanup unit (SCU). The cleanup action alternatives are described in Section 12 of the FS. A reasonable restoration timeframe for cleanup actions is i defined in the Sediment Cleanup User's Manual (SCUM) as 10 years following completion of construction (Ecology 2021).

The eight cleanup action alternatives include a combination of capping, enhanced natural recovery (ENR), and monitored natural recovery (MNR). Section 1.0 of this appendix discusses the approach used to estimate surface sediment concentrations at the completion of the cleanup action construction in the sediment management areas (SMAs) where MNR or ENR are applied as part of the cleanup action (SMA-13 and SMA-14). The remainder of the SCU will be capped and the surface sediment concentrations in the SMAs where capping is applied are the chemical concentration of the sand used for the caps. Capping materials will be tested prior to placement to ensure that they meet the cleanup criteria.

Compliance with preliminary cleanup levels and screening levels is evaluated differently depending on the exposure mechanism and receptor. Protection of the sediment benthic invertebrate community is evaluated on a point-by-point basis whereas, protection of human health and organisms that may be exposed to sediment contaminants via ingestion of food (bioaccumulation) is evaluated on a surface-area-weighted average concentration (SWAC) basis.

The MNR and ENR approaches presented in Section 1.0 are used in Sections 2.0 and 3.0 to evaluate the restoration timeframe for meeting cleanup and screening levels for benthic and bioaccumulative contaminants of concern (COCs) throughout the SCU.

This appendix uses the following terms (see Figure 13A-1):

- SCU the sediment portion of the AOI.
- Lake Shore the relatively shallow nearshore zone of the SCU.
- Lake Slope the steep sloped portion of the SCU adjacent to the Lake Shore zone.
- Lake Bottom the slightly sloping bottom portion of the SCU that extends towards the center of the lake from the lake slope zone.
- SMA-13 a SMA delineated within the SCU. SMA-13 is a subset of the lake bottom zone.
- SMA-14 a SMA delineated within the SCU. SMA-14 is a subset of the lake bottom zone and is same area as the natural recovery area identified in Section 6.6 of the RI.

The SCU is comprised of 12 SMAs (SMA-3 through SMA-14). These SMA's are included in the restoration timeframe evaluation. A groundwater management area (GWMA-1) and two upland areas (SMA-1 and SMA-2) are not included in the evaluation because they are not part of the SCU. Figure 13A-2 shows the SMAs, included in the restoration timeframe evaluation and the sediment remediation technology considered in the FS for each SMA.



1.0 NATURAL RECOVERY EVALUATION

The natural recovery of sediment refers to processes such as chemical and biological degradation, sedimentation (i.e., burial beneath clean sediment) and bioturbation (e.g., mixing, oxidation) that result in reduced contaminant concentrations in surface sediment and increased isolation of contaminated sediment over time.

MNR relies entirely on natural recovery processes to ensure compliance with the cleanup objectives. ENR includes the placement of a thin layer of sand to accelerate natural recovery processes to comply with cleanup objectives. For both MNR and ENR, monitoring is performed to verify that the cleanup levels are met within an acceptable time period.

1.1. Monitored Natural Recovery

Cleanup action Alternatives 1 through 7 use MNR in SMA-14 as part of the comprehensive cleanup strategy. ENR rather than MNR is used in SMA-14 in cleanup action Alternative 8 (see FS Section 12). MNR is only applicable to the restoration timeframe evaluation for bioaccumulative COCs (carcinogenic polycyclic aromatic hydrocarbons (cPAHs), arsenic, and chromium) in SMA-14. It is not applicable to the evaluation of restoration timeframe for benthic COCs in SMA-14 because, as discussed in Section 2.0, no benthic toxicity was observed in SMA-14.

Values used to calculate surface sediment concentrations in SMA-14 are as follows:

- **cPAHs**: the cPAH SWAC was calculated using data from surface sediment samples collected in 2005, then the natural recovery model presented in Section 1.3 was used to estimate the cPAH SWAC in 2029, the estimated time of remedy construction completion.
- **Arsenic**: the arsenic SWAC was calculated using surface sediment data from samples collected in 2005. The preliminary arsenic cleanup level (CUL) was achieved at the time of remedy construction completion (see Section 3.1), while conservatively using 2005 data and not accounting for any additional recovery between 2005 and 2029.
- **Chromium**: the chromium SWAC was calculated using the maximum detected surface sediment concentration in SMA-14 from samples collected in 2005. The chromium screening level was achieved at the time of remedy construction completion (see Section 3.2), while conservatively using 2005 data and not accounting for additional recovery between 2005 and 2029.

1.2. Enhanced Natural Recovery

The eight cleanup action alternatives evaluated in the FS use ENR as part of the comprehensive cleanup strategy. Alternatives 1 through 7 use ENR in SMA-13, while Alternative 8 uses capping in SMA-13 and ENR in SMA-14. FENR is assumed to include placement of a 6-inch equivalent layer of sand onto the contaminated sediment surface that will mix with the existing sediment and accelerate natural recovery processes (biological degradation, sedimentation, and bioturbation) to reduce contaminant concentrations over time.

To evaluate the restoration timeframe of the eight cleanup action alternatives, the concentrations of the GWPS and co-located ambient Lake Union (ALU) COCs within SMA-13 and SMA-14 following placement of a 6-inch sand layer were estimated using the equation and values below. The sand layer was assumed to completely mix with the existing surface sediments. Because the existing surface sediment is markedly



finer (mostly silts) and less dense than the placed sand layer, the difference in densities needed to be accounted for when estimating the post-placement concentration within the biologically active zone (upper 10 centimeters of sediment) in each SMA.

ENR-adjusted concentration (see below of a description of the parameters in this equation) =

$$[40.9 \, kg/cf * (COC \, surface \, sediment \, mg/kg) + 6.04 \, kg/cf * (COC \, sand \, mg/kg)]/2$$

 $40.9 \, kg/cf \, divided \, by \, 2 + 6.04 \, kg/cf \, divided \, by \, 2$

Parameters used to estimate surface sediment concentrations following placement of the sand layer area (ENR-adjusted concentrations) are as follows:

- Surface sediment concentrations: maximum detected concentrations in SMA-13 for benthic COCs (Table 13A-1) and SWACs in SMA-13 and SMA-14 for bioaccumulative COCs (Table 13A-2) were used. The approaches used in Section 1.1 to calculate SWACs for cPAHs, arsenic, and chromium in SMA-14 were also used to calculate SWACs for the same COCs in SMA-13 prior to accounting for the placement of the 6-inch sand layer.
- Sand concentrations: reporting limits for organic COCs and median soil concentrations from samples collected at quarries and pits in the Puget Sound area for metals (Papadopulos and Associates, Inc. 2002) were used (Tables 13A-1 and 13A-2).
- Density of sand and lake bottom sediment: 90 pounds per cubic foot (pcf) for sand and 13.3 pcf for lake bottom sediment were assumed. For the ENR-adjusted concentration calculations, these values were converted to 40.9 kilograms per cubic feet (kg/cf) for sand and 6.04 kg/cf for lake bottom sediment.

The ENR-adjusted maximum detected concentrations for benthic COCs are presented in Table 13A-1, and the restoration timeframe evaluation is presented in Section 2.0. The ENR-adjusted SWAC concentrations for bioaccumulation COCs are presented in Table 13A-2, and the restoration timeframe evaluation is presented in Section 3.0.

1.3. Natural Recovery Model: SMA-14

Available data show that natural recovery has been occurring in SMA-14 (Figure 13A-1)¹ since the MGP stopped operating in 1956 as evidenced by the changes in surface sediment concentrations of COCs and burial of historical contamination over time. The rate of change based on empirical data for cPAHs is depicted in Figure 13A-3. Based on the existing data, natural recovery is expected to continue after the sediment remedy is completed due to the removal and capping of contaminated sediment and as other lake-wide source controls continue to reduce point source discharges of solids to the lake.

Reductions in cPAH concentrations following implementation of the remedy were estimated for SMA-14. It was anticipated that the post-construction inputs of cPAHs to SMA-14 would decrease due to the benefit of active remediation in the lake shore and lake slope zones and additional source control activities in Lake

 $^{^{\}rm 1}$ Figure 13A-1 shows the lakeshore, lake slope and lake bottom zones of the SCU.



Union². A reduction in cPAH concentrations in sediment outside the SCU would improve the ability to achieve preliminary cleanup levels within the SCU.

Future cPAH TEQ concentrations were predicted using the 2004/2005 area-weighted average of SMA-14 as the initial sediment concentration (i.e., 3.3 mg/kg). The initial suspended solids cPAH TEQ concentration was estimated based on suspended solids samples collected in catch basins in the Wallingford and University District neighborhoods over the last decade³. cPAH TEQ concentrations reported in suspended solids in catch basins sampled between 2009 and 2015 ranged from 0.5 to 1.4 mg/kg, with a median concentration of 1.0 mg/kg. These catch basin solids concentrations were adjusted to represent 65 percent of the sediment input to address the different sources of suspended particles in the lake. According to the petrology analysis conducted as part of the Stanford University study (Appendix 2D of the RI), about 35 percent of the solids that settle to the lake bottom zone originate as biological material (e.g., plants, plankton, diatoms, etc.) in the water column. It was assumed that this fraction of suspended sediment is not contaminated with cPAHs because cPAHs are not readily bioavailable and are not expected to accumulate in the biogenic fraction. The median concentration of 1.0 mg/kg cPAH TEQ, adjusted to 0.65 mg/kg cPAH to account for the biogenic fraction, was used as the initial input concentration for mineral fraction of suspended sediment in the natural recovery estimate.

It is further assumed that suspended solids cPAH concentrations would decline at a rate of 6 percent per year, the lowest annual rate of change measured in SMA-14, until completion of remedy construction in 2029 and implementation of additional source controls in 2025. Following remediation, natural recovery will potentially be accelerated due to the elimination of lake shore and lake slope sources of contamination to the lake bottom zone; a single 20 percent reduction is, therefore, assumed to occur in 2029. Additional source controls are scheduled to be completed around 2025 for the Lake Washington Ship Canal, which will further support the natural recovery of the lake bottom zone. Another 10 percent reduction is assumed to occur in 2026 because of this additional source control project, followed by a 6 percent reduction per year through the period of interest.

Future (post-2005) surface sediment cPAH SWACs in SMA-14 were calculated as follows:

- Each year, starting in 2006, 1 cm of sediment is assumed to be deposited in SMA-14. This assumption is based on the sediment deposition evaluation presented in Section 3.2.4 of Appendix 11C.
- The newly deposited 1 cm of sediment is assumed to mix with the 4 cm of sediment below (that is, what used to be the top 4 cm of sediment).
- The remaining 5 cm of sediment within the surface sediment interval (aka, the biologically active zone) are unaffected.
- The surface sediment cPAH SWAC is the average cPAH concentration in the top 10 cm of sediment.

To address the uncertainties associated with predicting future natural recovery, inputs were varied to represent a range of natural recovery rates. The inputs that were varied included initial suspended solids concentration, the rate of annual reduction in suspended solids concentrations each year due to ongoing

³ This approach likely represents a worst-case estimate of concentrations of suspended solids because there are other sources of cleaner sediment to Lake Union that are not accounted for.



² Potential releases of suspended sediment during dredging or capping will be subject to engineering controls to minimize short-term impacts of inwater work; redistribution of suspended sediment is anticipated to be localized.

source controls, and the effect of the cleanup and the City of Seattle/King County Ship Canal Water Quality project on suspended solids concentrations. The range of values used are summarized in the table below, along with an estimate of the year that the cleanup level would be achieved.

A sensitivity analysis was conducted by varying each of these four input parameters, one at a time, by using input values associated with the slower and faster recovery scenarios shown below. The purpose of the sensitivity analysis was to see which input parameters have the most significant effect on the year the preliminary cleanup level is achieved in SMA-14. The sensitivity analysis results are shown in Figure 13A-4 and indicate that the year the preliminary cleanup level is achieved is most affected by the initial suspend solids concentration and the rate of annual reduction in suspended solids concentrations. This is because 20 to 24 years of natural recovery will have occurred between 2005 and completion of City of Seattle/King County Ship Canal Water Quality project and the GWPS cleanup.

Model Input Parameter ^a (all refer to cPAH TEQ concentrations)	Slower Rate of Recovery Scenario	Moderate Rate of Recovery Scenario	Faster Rate of Recovery Scenario
Initial SWAC in SMA-14 (mg/kg)	3.3	3.3	3.3
Sediment Deposition Rate (cm/year)	1.0	1.0	1.0
Initial Suspended Solids Concentration (SSC) (mg/kg)	1.0	0.65	0.5
Annual SSC Reduction (percent)	3	6	17
SSC Reduction Due to Cleanup (percent)	10	20	30
SSC Reduction Due to Water Quality Project (percent)	5	10	20
Year Preliminary Cleanup Level Is Predicted to be Achieved within SMA-14	2059	2030	2022

^a Estimated rates of recovery for model parameters are based on available data or best professional judgement. The basis for the initial SWAC, initial suspended solids concentrations, and reductions in suspended solids concentrations are described in previous paragraphs in Section 1.3.

The natural recovery model results are shown in Figure 13A-5. The Moderate Rate of Recovery Scenario shows that the preliminary cleanup level for cPAHs is likely to be achieved in SMA-14 within 1 year following implementation of the cleanup action. In accordance with the SCUM, a restoration timeframe of 10 years is considered reasonable. The Moderate Rate of Recovery Scenario is appropriate for use in evaluating restoration timeframe because the initial suspended solids cPAH concentration of 0.65 mg/kg and the rate of annual reduction in suspended solids concentrations each year of 6 percent are reasonably conservative values. The initial suspended solids cPAH concentration is based on the median suspended solids concentration detected in in catch basins in the Wallingford and University District neighborhoods over the last decade and the annual reduction in suspended solids concentrations is set at the lowest annual rate of change measured in samples collected from SMA-14 between 1984 and 2005.

Note that this evaluation was only for SMA-14. The preliminary cleanup levels and restoration timeframe requirements apply to the entire SCU (SMA-3 through SMA-14). Restoration timeframes for cleanup action Alternatives 1 through 8 across the entire SCU are discussed in Sections 3.1.3 and 3.1.4.



1.4. Applicability of Natural Recovery Model to SMA-13

The natural recovery model discussed above was developed for SMA-14 to show that MNR is a viable sediment remediation technology for SMA-14. Both SMA-13 and SMA-14 are within depositional portions of the lake bottom (see Sections 6 and 8 of the RI details) and, as discussed in Section 12 of the FS, SMA-13 and SMA-14 are natural recovery areas. ENR was selected as a sediment remediation technology for SMA-13 because, while existing data indicate that natural recovery is occurring in SMA-13, the concentrations are higher than in SMA-14 and, natural recovery processes will be accelerated by placing a thin (6-inch) layer of sand.

The following sections discuss the natural recovery model parameters and their applicability to SMA-13 and the temporal trends in cPAH TEQ concentrations within SMA-13.

1.4.1. Model Input Parameters

The natural recovery model is applicable to SMA-13 based on the following evaluation of the model input parameters:

- The sediment deposition rate of 1 cm/year used in the model was derived from studies completed in the lake bottom zone of the SCU and SMA-13 is in the lake bottom zone.
- The initial suspended solids cPAH TEQ concentration was based on suspended solids samples collected in catch basins in the Wallingford and University District neighborhoods. These samples are as applicable to SMA-13 as they are to SMA-14.
- The annual reduction in suspended solids concentration assumed in the model is 6 percent, based on the annual rate of change in SMA-14 surface sediment samples between 1995 and 1999. As discussed below (Section 1.4.2), the annual rates of change in SMA-13 between 1999 and 2002 and between 2002 and 2005 are greater than 6 percent and greater than corresponding reductions in SMA-14.
- The reduction in suspended solids concentrations due to the cleanup and the City of Seattle/King County Ship Canal Water Quality project are expected to have similar effects on SMA-13 and SMA-14 cPAH TEQ surface sediment concentrations.

1.4.2. Temporal Trends in cPAH TEQ Concentrations in SMA-13

The temporal trends in cPAH TEQ concentrations were evaluated within SMA-13 area using GIS interpolation and averaging methods (samples and area evaluated are depicted in Figure 13A-6). The cPAH TEQ data from samples obtained primarily in 1999, 2002, and 2004/2005 were used to calculate cPAH TEQ SWACs for each sampling period to estimate the percent reduction in cPAH TEQ concentrations in surface sediment in SMA-13. The GIS interpolation of cPAH TEQ surface sediment concentrations for these three periods is shown on Figure 13A-6.

For comparison purposes, the cPAH TEQ concentrations in SMA-14 for the same sampling periods are included the table below.



Period	cPAH TEQ SWAC (mg/kg) SMA-13 [SMA-14]	Percent Reduction Since Previous Period SMA-13 [SMA-14]	Average Annual Reduction Percent SMA-13 [SMA-14]
1999	106 [23]		
2002	27 [10]	74 [57]	27 [24]
2004/2005	7.3 [3.3]	73 [67]	35 [31]
Overall reduction be	tween 1999 and 2004/2005	93 [86]	36 [18]

^a Based on limited data points.

As shown in the table above, the percent reductions in cPAH TEQ concentrations between 1999 and 2002 and between 2002 and 2004/2005 are greater in SMA-13 than in SMA-14. However, the 2004/2005 cPAH TEQ SWAC in SMA-13 (7.3 mg/kg) is over twice the SWAC in SMA-14 (3.3 mg/kg).

1.4.3. Summary

Based on the information above, the natural recovery model is appropriate for use in estimating future cPAH TEQ concentrations in SMA-13. In Alternatives 1 through 7, ongoing natural recovery processes will be accelerated by placing a thin (6-inch) layer of sand (see Section 3.1).

2.0 BENTHIC COCS

GWPS and co-located ALU COCs with preliminary CULs or screening levels based on protection of benthic organisms are presented in Table 13A-1.

The remedial investigation (RI) identified areas of benthic toxicity based on bioassay data (see Appendix 5D for the evaluation). Areas of benthic toxicity were found in portions of SMAs 3 through 9 and SMAs 11 through 13 (Figure 13A-1). As shown on Figure 13A-1, SMAs 3 through 12 will be capped by a combination of sand caps, thick sand caps, or enhanced (low permeability or amended) caps. ENR will be applied to SMA-13 in Alternatives 1 through 7 and SMA-13 will be capped in Alternative 8. Compliance with benthic-based preliminary CULs and screening levels in SMA-13 for Alternatives 1 through 7 after placement of the sand layer is the focus of this section.

MNR is only applied to SMA-14 in Alternatives 1 through 7 and, therefore, is not applicable to the restoration timeframe evaluation of benthic COCs because benthic toxicity is not observed in SMA-14.

The restoration timeframe evaluation for GWPS and co-located ALU COCs in SMA-13 (for Alternatives 1 through 7) is presented in Table 13A-1. As shown in Table 13A-1, GWPS COC preliminary CULs will be achieved at the completion of remedy construction. Co-located ALU COC screening levels will also be achieved at the time of completion of construction, with the exception of sulfide, tributyltin, and silver. However, it is reasonable to assume that screening levels will be achieved for these COCs within 10 years following completion of construction as outlined below:

Sulfide: The restoration timeframe evaluation did not account for natural recovery. In addition, sulfide concentrations under ENR technologies will be lower than predicted due to mixing and oxygenation of the sediment following placement of the sand material. Lastly, the highest sulfide concentrations within the SCU are in SMA-14, however, no benthic toxicity was associated with this SMA, indicating that



sulfides may not be contributing to benthic impacts. Sulfides will be further evaluated during future design investigation efforts and the ENR approach may need to be altered in order to meet screening levels within 10 years following completion of construction.

- **TributyItin**: The restoration timeframe evaluation did not account for natural recovery. In addition, the use of tributyItin was restricted in the late 1990s and was banned outright in 2008; and dredging was completed at the Northlake Shipyard in 2013 and 2014, which removed source material adjacent to the SCU. TributyItin will be further evaluated during future design investigation efforts and the ENR approach may need to be altered in order to meet screening levels within 10 years following completion of construction.
- Silver: The evaluation did not account for natural recovery. Silver will be further evaluated during future design investigation efforts and the ENR approach may need to be altered in order to meet screening levels within 10 years following completion of construction.

3.0 BIOACCUMULATION COCS

Compliance with bioaccumulation cleanup levels and screening levels is based on SWACs. Accordingly, post-construction surface sediment concentrations in each SMA were estimated to calculate an SCU-wide SWAC.

This restoration timeframe evaluation is discussed separately for GWPS (arsenic and cPAHs) and co-located ALU (chromium) COCs in the sections below.

ENR-adjusted surface sediment concentrations are used in Sections 3.1 and 3.2 to estimate SCU-wide surface sediment SWACs. The equation and parameters used to estimate the ENR-adjusted concentrations is presented in Section 1.2 and the unadjusted surface sediment SWACs, and concentrations, and ENR-adjusted surface sediment SWACs for SMA-13 and SMA-14 are presented in Table 13A-2.

3.1. GWPS COCs

Arsenic and cPAHs are the only GWPS COCs with preliminary CULs based on bioaccumulation. The approach for evaluating these two COCs is described below.

3.1.1. Arsenic

Arsenic is conservatively evaluated using surface sediment data from samples collected in 2005 without assuming additional recovery between 2005 and 2029. Arsenic concentrations used to calculate an SCU-wide surface sediment SWAC at the time of completion of construction are as follows:

- SMAs with capping: 2.9 mg/kg is the assumed arsenic concentration of the sand used for capping and is the median soil concentrations from quarries and pits in the Puget Sound area for arsenic (Papadopulos and Associates, Inc. 2002).
- SMAs with ENR: the surface sediment arsenic post-construction SWAC is the surface sediment SWAC calculated using data from samples collected in 2005 adjusted for placement of a 6-inch sand layer as described in Section 1.0 (see Table 13A-2).



SMAs with MNR: the surface sediment arsenic post-construction SWAC is the surface sediment SWAC calculated using 2005 sample data (i.e., 2005 data are used to represent 2029 post-construction conditions without accounting for further recovery since 2005).

3.1.2. cPAHs

cPAHs were evaluated using surface sediment data from samples collected in 2005. cPAH SWACs for SMAs 13 and 14 were calculated using the 2005 data, then the natural recovery model presented in Section 1.3 was used to estimate the cPAH SWACs for 2029. The applicability of the model to SMA13 is discussed in Section 1.4. The 2029 SWAC results, along with assumed cPAH sand concentrations, were used to calculate an SCU-wide surface sediment SWAC at the completion of construction. Details for the cPAH concentrations are as follows:

- SMAs with capping: 0.009 mg/kg, which is the programmatic sediment practical quantitation limit (PQL) from Ecology's Sediment Cleanup User's Manual (SCUM) guidance. This is the assumed sand concentration used for the cap areas.
- SMAs with ENR: surface sediment cPAH post-construction concentration is the estimated 2029 surface sediment SWAC adjusted for placement of a 6-inch sand layer as described in Section 1.0.
- SMAs with MNR: 2029 surface sediment cPAH post-construction concentration is the estimated 2029 surface sediment SWAC.

3.1.3. Arsenic and cPAH Restoration Timeframe Evaluation for Cleanup Action Alternatives 1 through 7

Cleanup action Alternatives 1 through 7 include capping in SMAs 3 through 12, ENR in SMA-13, and MNR in SMA-14. The table below shows that the SCU-wide SWAC immediately following construction will be less than the preliminary CULs for arsenic and cPAHs for these alternatives. Accordingly, an evaluation of 10 years post-construction was not completed.

			Post-Constru	uction SWACs	
	Preliminary	SMAs 3 - 12 (Cap)	SMA-13 (ENR)	SMA-14 (MNR)	SCU
GWPS COCs	CUL	23 Acres	10 Acres	23 Acres	56 Acres
Arsenic (mg/kg)	24	2.9	17	28	15
cPAHs (mg/kg TEQ)	0.21	0.009	0.046	0.26	0.12

3.1.4. Arsenic and cPAH Restoration Timeframe Evaluation for Cleanup Action Alternative 8

Alternative 8 includes capping in SMAs 3 through 13 and ENR in SMA-14. The table below shows that the SCU-wide SWAC immediately following construction will be less than the preliminary CULs for arsenic and cPAHs for Alternative 8.

			Post-Constru	ction SWACs	
	Preliminary	SMAs 3 - 12 (Cap)	SMA-13 (CAP)	SMA-14 (ENR)	scu
GWPS COCs	CUL	23 Acres	10 Acres	23 Acres	56 Acres
Arsenic (mg/kg)	24	2.9	2.9	6.1	4.2
cPAHs (mg/kg)	0.21	0.009	0.009	0.041	0.022



3.2. CO-LOCATED ALU COCs

Chromium, hexachlorobenzene, methylmercury, pentachlorophenol, chlordane, and polychlorinated biphenyls (PCBs) are co-located with GWPS COCs and were identified as ALU COCs based on bioaccumulation. A restoration timeframe evaluation was completed for chromium. However, the factors discussed in Section 3.2.4, prevent a restoration timeframe evaluation for hexachlorobenzene, methylmercury, pentachlorophenol, chlordane, and PCBs.

3.2.1. Chromium

Chromium is conservatively evaluated using the maximum detected surface sediment concentrations from SMA-13 and SMA-14 without assuming additional recovery between sample collection (2005 or earlier) and 2029. Chromium concentrations used to calculate an SCU-wide surface sediment SWAC at the time of completion of construction are as follows:

- SMAs with capping: 25 mg/kg is the assumed chromium concentration of the sand used for capping and is the median soil concentrations from quarries and pits in the Puget Sound area for chromium (Papadopulos and Associates, Inc. 2002).
- SMAs with ENR: the surface sediment chromium post-construction SWAC is the maximum detected surface sediment concentration adjusted for placement of a 6-inch sand layer as described in Section 1.0.
- SMAs with MNR: the surface sediment chromium post-construction SWAC is the maximum detected surface sediment concentration in the SMA (i.e., the maximum detected concentration is used to represent 2029 post-construction conditions without accounting for further recovery since sample collection [2005 or earlier]).

3.2.2. Chromium Restoration Timeframe Evaluation for Cleanup Action Alternatives 1 through 7

The table below shows that the SCU-wide SWAC immediately following construction will be less than the screening level (SL) for chromium for Alternatives 1 through 7. Accordingly, an evaluation for 10 years post-construction was not completed.

			Post-Construc	ction SWACs	
		SMAs 3 - 12 (Cap)	SMA-13 (ENR)	SMA-14 (MNR)	scu
ALU COC	SL	23 Acres	10 Acres	23 Acres	56 Acres
Chromium (mg/kg)	62	25	34	70	45

3.2.3. Chromium Restoration Timeframe Evaluation for Cleanup Action Alternative 8

The table below shows that the SCU-wide SWAC immediately following construction will be less than the SL for chromium for Alternative 8.

			Post-Construc	tion SWACs	
		SMAs 3 - 12 (Cap)	SMA-13 (CAP)	SMA-14 (ENR)	scu
ALU COC	CUL	23 Acres	10 Acres	23 Acres	56 Acres
Chromium (mg/kg)	62	25	25	31	27



3.2.4. No Restoration Timeframe Evaluation was Completed for Hexachlorobenzene, Methylmercury, Pentachlorophenol, Chlordane, and PCBs

Restoration timeframes were not evaluated for Hexachlorobenzene, chlordane, methylmercury, pentachlorophenol, and PCBs because there are limited available surface sediment sample data or detections within the SCU. The details for each analyte are as follows:

- Hexachlorobenzene: As noted in Appendix 4E, there is uncertainty as to whether hexachlorobenzene qualifies as an ALU COC. Hexachlorobenzene was not analyzed for in crayfish tissue and was not included in the risk assessment that was used to help identify bioaccumulation COCs (see Appendix 4C). In addition, hexachlorobenzene was only detected in 2 out of 87 surface sediment samples collected in the SCU (NLU-130-SS and NLU-53-SS). NLU-130-SS was collected within SMA-6, which will be capped. NLU-53-SS was collected in SMA-14, which will undergo monitored or enhanced natural recovery. Hexachlorobenzene was detected at a concentration of 0.0022 mg/kg in NLU-53-SS, which is less than the screening level of 0.005 mg/kg. Hexachlorobenzene will be evaluated further during future remedial design efforts to verify that it is a co-located ALU COC and to evaluate restoration timeframe, if necessary.
- Methylmercury: As noted in Appendix 4E, there is uncertainty as to whether methylmercury qualifies as an ALU COC. Methylmercury was detected in the one surface sediment sample collected in the SCU. In addition, methylmercury was not analyzed for in crayfish tissue and was not included in the risk assessment that was used to help identify bioaccumulation COCs (see Appendix 4C). The limited number of surface sediment samples collected for methylmercury prevents the completion of a restoration timeframe evaluation for methylmercury. This analyte will be evaluated further during future remedial design efforts to verify that it is a co-located ALU COC and to evaluate restoration timeframe, if necessary.
- Pentachlorophenol and Chlordane: Both of these analytes were identified as bioaccumulative ALU COCs based on the risk assessment that was used to help identify bioaccumulation COCs (see Appendix 4C). However, neither analyte was detected in crayfish tissue samples that were used in the risk assessment. The unacceptable risk estimates were based on one-half of the maximum method detection limit for each analyte. Pentachlorophenol and chlordane were detected in 8 out of 79 and 8 out of 29 surface sediment samples collected within the SCU, respectively. The limited number of surface sediment samples collected for chlordane and the limited number of detections for both analytes prevent the completion of a restoration timeframe evaluation for pentachlorophenol and chlordane. These analytes will be evaluated further during future remedial design efforts to verify that they are co-located ALU COCs and to evaluate restoration timeframes, if necessary.
- **PCBs**: Insufficient time series data are available to perform a restoration timeframe evaluation for PCBs. This analyte will be evaluated further during future remedial design efforts to verify that it is a co-located ALU COC and to evaluate restoration timeframe, if necessary.

For the FS, it is assumed that these five co-located ALU COCs will meet their respective screening levels within 10 years following completion of construction (currently scheduled for completion in 2029). This will be verified during future remedial design activities.



4.0 SUMMARY

As discussed above, the GWPS COCs will achieve preliminary cleanup levels, and co-located ALU chromium concentrations will achieve screening levels, immediately following completion of construction.

Based on the rationale presented in previous sections, co-located ALU benthic COCs (sulfide, tributyl tin and silver) and co-located ALU bioaccumulation COCs (hexachlorobenzene, methylmercury, pentachlorophenol, chlordane, and PCBs) are assumed to achieve screening levels within 10 years following completion of construction. These assumptions will be verified through further evaluation during future remedial design efforts, and a restoration timeframe evaluation will be completed if necessary.

5.0 REFERENCES

Papadopulos and Associates, Inc. 2002. Seattle-Tacoma International Airport Third Runway Embankment Fill Water-Quality and Transport Analysis. Final. February 15, 2002.

Washington Department of Ecology (Ecology). 2021. Sediment Cleanup User's Manual; Guidance for Implementing the Provisions of the Sediment Management Standards, Chapter 173-204 WAC. Publication No. 12-09-057. Third Revision December 2021.



Table 13A-1

Benthic COCs: Enhanced Natural Recovery Evaluation (SMA-13)

Gas Works Park Site Seattle, Washington

							SMA-13 Enhanced Natu	ral Recovery Evaluation	1
Analyte Group	Contaminants of Concern ^a	Unit	Preliminary Cleanup/Screening Level ^b	Number of Surface Sediment Samples Collected within SMA-13	Frequency of Detection (%)	Maximum Detected Surface Sediment Concentration ^c	Sand Concentration ^d	ENR-Adjusted Maximum Detected Surface Sediment Concentration ^e	ENR-Adjusted Maximum > CUL/SL
Conventionals	Sulfide	mg/kg	39	12	100	1,200	20	172	Yes
PAHs	Total PAH (GWPS COC)	mg/kg	30	12	100	172	0.02	22	No
TPH	Diesel Range Hydrocarbons ^f	mg/kg	340	1	100	2,420	5	320	No
	4-Methylphenol	mg/kg	0.26	12	0	all ND	not applicable	all ND	No
	Benzoic Acid	mg/kg	2.9	12	0	all ND	not applicable	all ND	No
	bis(2-Ethylhexyl)phthalate	mg/kg	0.50	12	100	2.2	0.025	0.30	No
SVOCs	Carbazole (GWPS COC)	mg/kg	0.90	12	25	0.25	0.02	0.050	No
37005	Dibenzofuran (GWPS COC)	mg/kg	0.20	12	8	0.073	0.02	0.027	No
	Di-n-Butyl phthalate	mg/kg	0.38	12	0	all ND	not applicable	all ND	No
	Di-n-Octyl phthalate	mg/kg	0.039	12	0	all ND	not applicable	all ND	No
	Phenol	mg/kg	0.12	12	0	all ND	not applicable	all ND	No
Pesticides	4,4'-DDE ^g	mg/kg	0.021	3	33	0.035	0.002	0.0062	No
Butyltins	Tributyl Tin	mg/kg	0.047	12	100	2.3	0.004	0.30	Yes
	Cadmium	mg/kg	2.1	12	75	3.0	0.2	0.56	No
	Copper	mg/kg	400	12	100	690	23	110	No
	Lead	mg/kg	360	12	100	810	3.2	110	No
	Mercury	mg/kg	0.66	12	100	2.5	0.1	0.41	No
	Nickel (GWPS COC)	mg/kg	50	10	100	90	27	35	No
	Silver	mg/kg	0.57	12	42	4	0.2	0.69	Yes

Notes:

CUL/SL = cleanup level or screening level

GWPS COC = Gas Works Park Site Contaminant of Concern

mg/kg = milligrams per kilogram

ND = not detected

PAH = polycyclic aromatic hydrocarbon

SVOCs = semivolatile organic compounds

TPH = total petroleum hydrocarbons



^a Analytes are ALU COCs co-located with GWPS COCs, except where noted.

^b Values are cleanup levels for GWPS COCs (RI Table 9-2) or screening levels (sediment cleanup objectives) for ALU COCs (RI Table 9-3)

 $^{^{\}rm c}$ Values are the maximum detected surface sediment concentration in SMA 13, expect where noted.

^d Values are reporting limits for organic COCs and median soil concentrations from samples collected at quarries and pits in the Puget Sound area for metals (Papadopulos and Associates, Inc. 2002).

^e Maximum detected concentrations adjusted to account for placement of 6-inches of sand (see text for details on calculation).

Diesel range hydrocarbons were not tested for in surface sediment samples collected in SMA-13. Only one sample was collected within the SCU, but outside SMA-13, and tested for diesel range hydrocarbons.

g Only three surface sediment were collected within SMA-13 and tested for 4,4'-DDE. However, 26 other surface sediment samples collected within the SCU, but outside SMA-13, were tested for 4,4'-DDE. The maximum detected 4,4'-DDE concentration within the SCU was from a sample collected within SMA-13.

Table 13A-2

Bioaccumulation COCs: Estimation of ENR-Adjusted Surface Sediment Concentrations (SMA-13 and SMA-14)

Gas Works Park Site Seattle, Washington

Analyte Group	Contaminants of Concern ^a	Unit	Preliminary Cleanup/Screening Level ^b	Surface Sediment SWAC ^c	Sand Concentration ^d	ENR-Adjusted Surface Sediment SWAC ^e
SMA-13						
Metals	Arsenic (GWPS COC)	mg/kg	24	113	2.9	17
Wetais	Chromium (ALU COC)	mg/kg	62	93	25	34
PAHs	cPAHs (GWPS COC)	mg/kg	0.21	0.294	0.009	0.046
SMA-14						
Metals	Arsenic (GWPS COC)	mg/kg	24	28	2.9	6.1
Metais	Chromium (ALU COC)	mg/kg	62	70	25	31
PAHs	cPAHs (GWPS COC)	mg/kg	0.21	0.261	0.009	0.041

Notes:

ALU COC = Ambient Lake Union Contaminant of Concern

GWPS COC = Gas Works Park Site Contaminant of Concern

mg/kg = milligrams per kilogram

PAH = polycyclic aromatic hydrocarbon



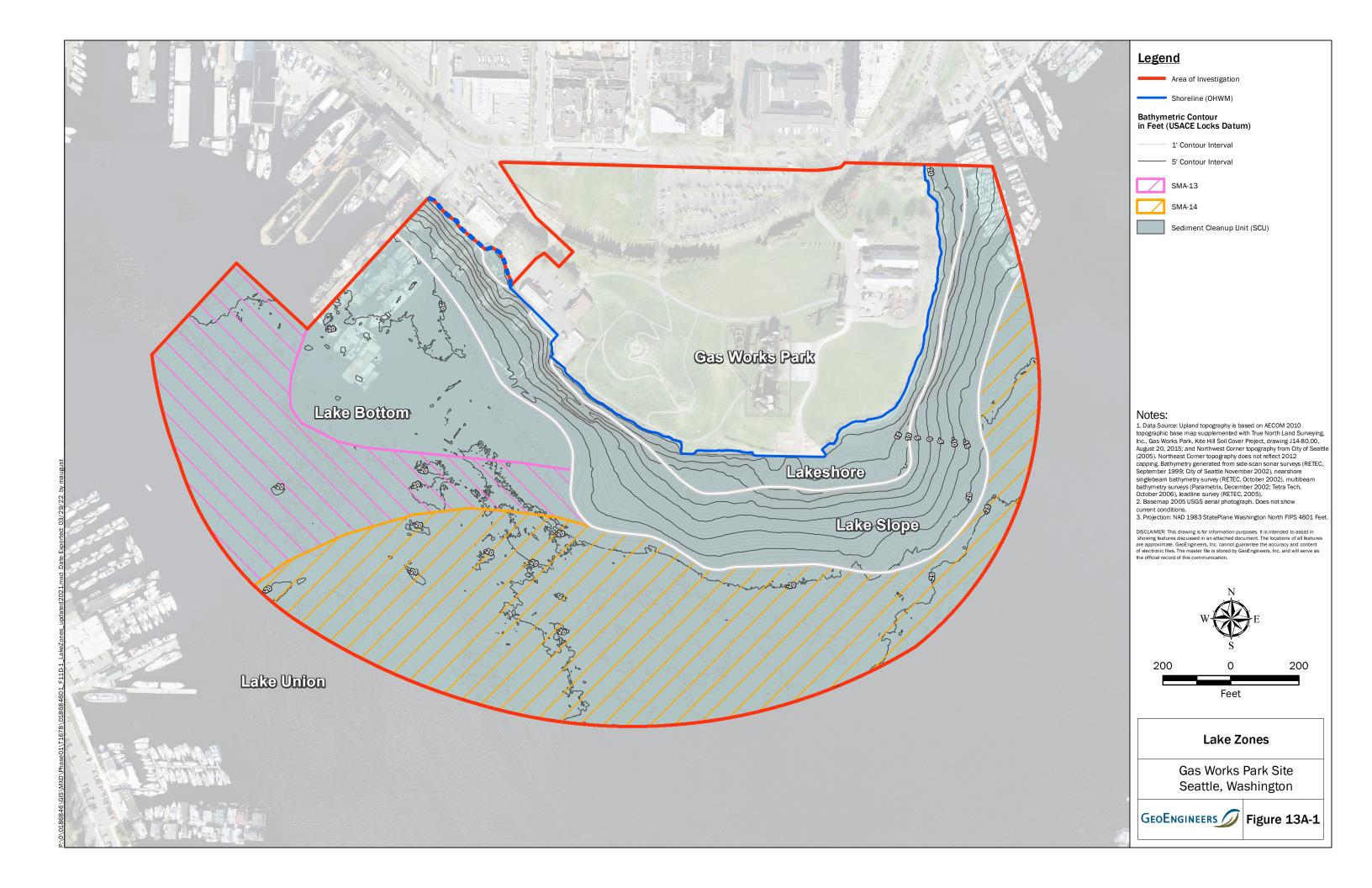
^a ALU COCs are co-located with GWPS COCs.

^b Preliminary cleanup and screening levels are applicable to the sediment cleanup unit, not to individual SMAs.

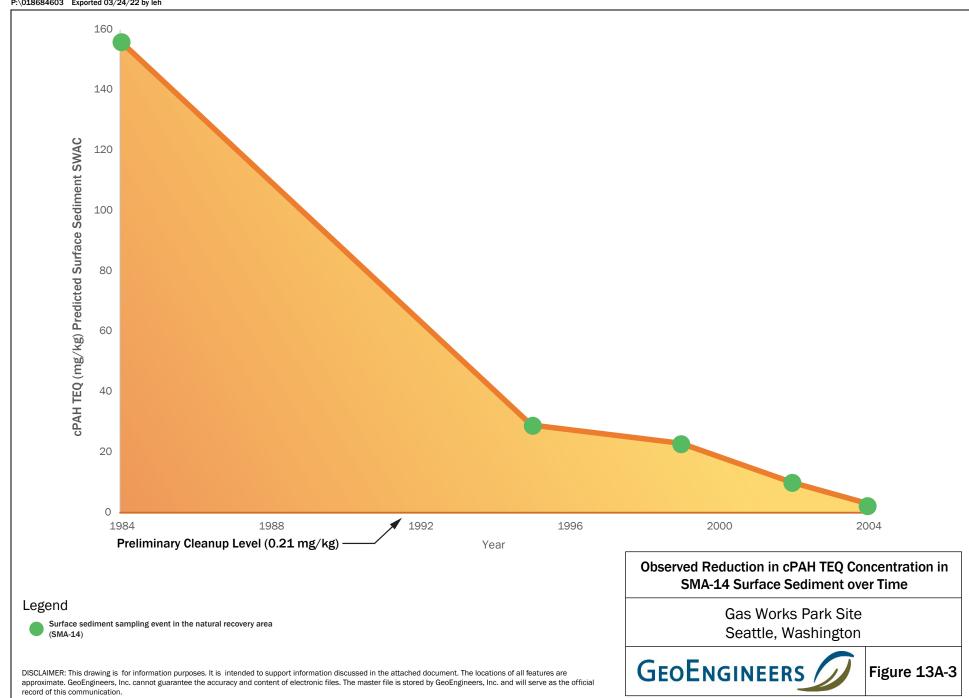
^c The basis of each SWAC is discussed in Section 3 of the text.

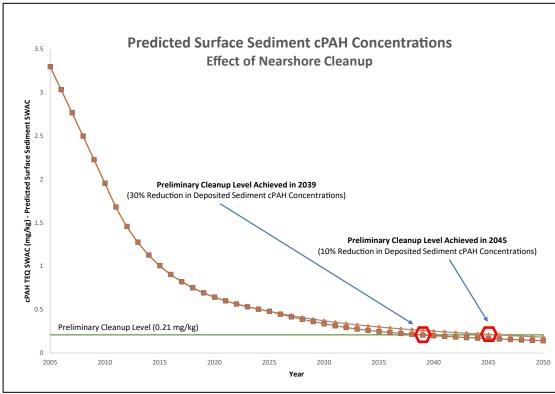
^d Values are Ecology's programatic sediment practical quantitation limit for cPAHs and and median soil concentrations from samples collected at quarries and pits in the Puget Sound area for arsenic and chromium (Papadopulos and Associates, Inc. 2002).

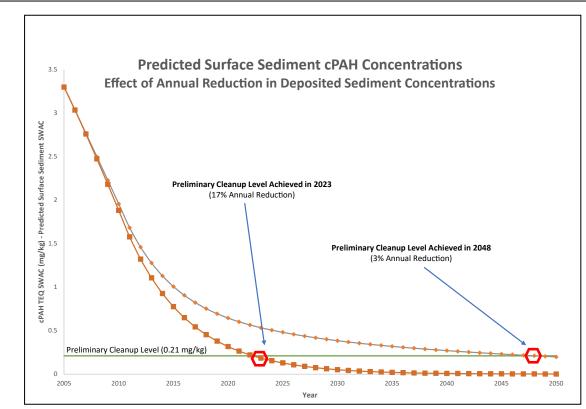
^e Surface sediment SWAC values adjusted to account for placement of 6-inches of sand (see text for details on calculation).

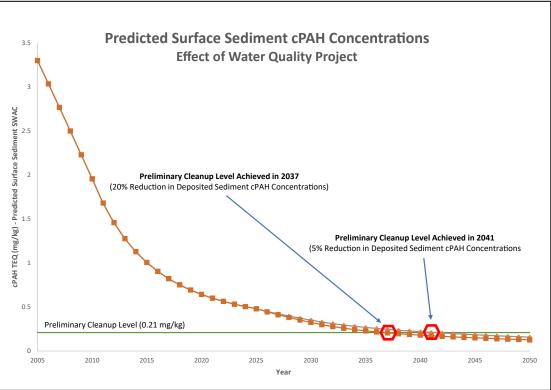












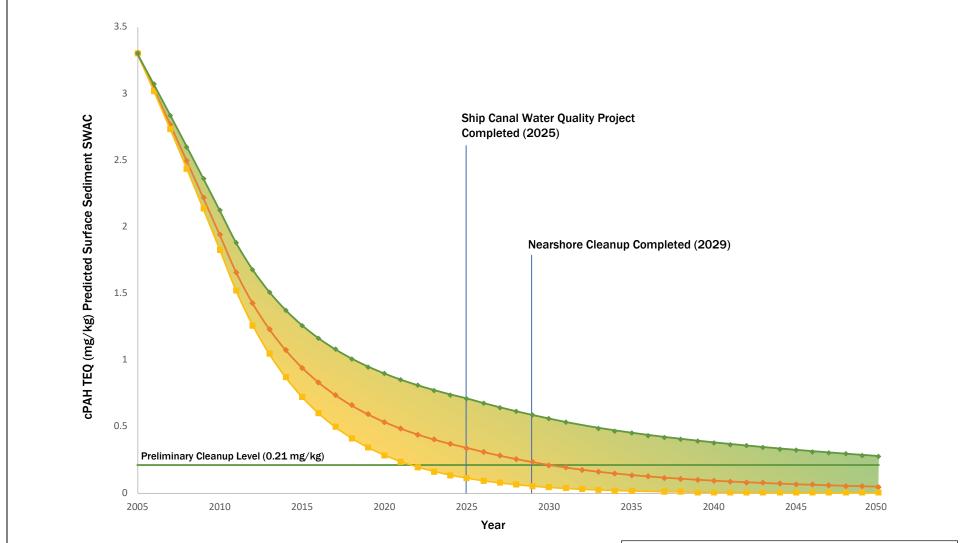
Future Natural Recover in Natural Recover Area Surface Sediment, Sensitivity Analysis

Gas Works Park Site Seattle, Washington



1. Information on how predicted cPAH surface sediment SWACs are calculated is included in the text (Section 1.3).

DISCLAIMER: This drawing is for information purposes. It is intended to support information discussed in the attached document. The locations of all features are approximate. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.



Legend

Moderate Rate of Recovery
 Slower Rate of Recovery
 Faster Rate of Recovery

Notes:

1. Information on how predicted cPAH surface sediment SWACs are calculated is included in the text (Section 1.3).

DISCLAIMER: This drawing is for information purposes. It is intended to support information discussed in the attached document. The locations of all features are approximate. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Future Natural Recovery Surface Sediment in the Natural Recovery Area

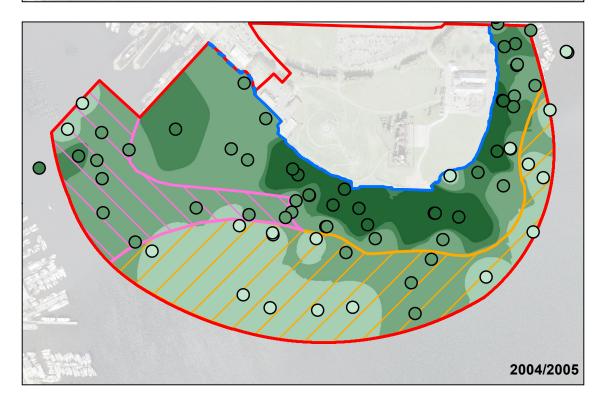
Gas Works Park Site Seattle, Washington

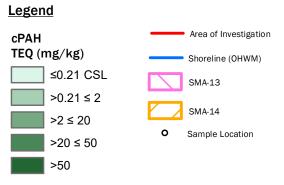


Figure 13A-5









Notes:

- PAH sediment screening level = 0.21 mg/kg (CSL).
 For mapping purposes surface sediment is defined as the top 6 inches of sediment.
- o incries or seatment.

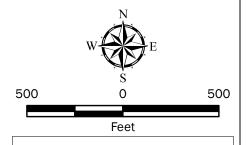
 3. ArcGIS Inverse Distance Weighted (IDW) interpolation settings: Power = 6, Neighbors = 8, Radius = 1,000 feet.

 4. Where cPAH was not detected, 1/2 the reporting limit was used in the interpolation.

 5. Basemap 2005 USGS aerial photograph. Does not show current conditions.

 6. Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet.

DISCLAIMER: This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. The locations of all features are approximate. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.



Temporal cPAH TEQ Trends in Surface Sediment 1999-2005

> Gas Works Park Site Seattle, Washington



Figure 13A-6

APPENDIX 13B Alternative Cost Assumptions and Tables

Table of Contents

Table 13B-8. Alternative 6 Table 13B-9. Alternative 7 Table 13B-10. Alternative 8

Table 13B-11. Quantities Used for Detailed Cost Estimates

APPENDIX 13B REMEDIAL ALTERNATIVE COSTS	13B-1
Major Cost Assumptions	13B-1
REFERENCES	13B-3
TABLES	
Table 13B-1. Alternatives Cost Estimate Summary	
Table 13B-2. Unit costs Used for Detailed Cost Estimates	
Table 13B-3. Alternative 1	
Table 13B-4. Alternative 2	
Table 13B-5. Alternative 3	
Table 13B-6. Alternative 4	
Table 13B-7. Alternative 5	



APPENDIX 13B REMEDIAL ALTERNATIVE COSTS

This appendix provides the detailed cost estimates for alternatives evaluated in the Gas Works Park Site (GWPS) Feasibility Study (FS). Cost estimates have been developed for the seven remedial alternatives described in Section 12 of the FS document. The following information is provided in this appendix:

- Major cost assumptions
- Alternatives cost estimation summary (Table 13B-1)
- Unit costs and basis for detailed cost estimates (Table 13B-2)
- Detailed cost estimates for the seven remedial alternatives (Tables 13B-3 through Table 13B-9)
- Estimated quantity, material volume and area for the seven remedial alternatives (Table 13B-10)

The costs for each alternative include capital (direct and indirect) costs required to complete the cleanup action construction, long-term operation, maintenance, and monitoring (direct and indirect) for the assumed monitoring period following completion of the cleanup action. An overall project contingency is also applied to address unforeseen conditions at the conceptual design stage typical of an FS. For the purpose of FS cost estimating, a conceptual approach for construction, compliance and long-term monitoring was developed.

Reference information for calculating quantities to support the development of the cost estimate include scaled drawings and boring logs from the Remedial Investigation (RI) report showing lateral and vertical extent of contamination for the area of investigation (AOI). Geographic information system (GIS) and AutoCAD were the primary tools used to calculate areas and volumes and generate material quantities for the cost estimate.

The cost estimates were developed in accordance with the U.S. Environmental Protection Agency's (EPA) guidance document *Guide to Developing and Documenting Cost Estimates during Feasibility Study* (EPA 2000).

Major Cost Assumptions

- The cost estimates for each alternative, minus the applied contingency are order-of-magnitude costs within a range of -30 percent to +50 percent consistent with EPA's feasibility study cost estimating guidance (EPA 2000).
- 2. The cost estimates are based on professional judgment, literature reference, published construction cost resources (i.e., RS Means), vendor quotes, and experience on similar projects. The basis for unit costs is listed in the "Source/Assumptions" column in Table 13B-2.
- 3. The total cost includes capital costs (direct and indirect), operation and maintenance (O&M) costs (direct and indirect) and contingency.
- 4. Indirect capital costs include mobilization/demobilization, project management, permitting, remedial design, construction management and Ecology oversight. These elements are estimated based on a percentage of the direct capital costs, using consistent percentages across the seven alternatives. The



- total indirect capital costs are estimated as 50 percent of the total Direct Capital costs for each alternative.
- 5. Indirect O&M costs are developed and applied in a similar manner to the indirect capital cost and include project management, construction management and Ecology oversight. The total indirect O&M costs are estimated as 17 percent of the total Direct O&M costs.
- 6. Sales tax is not included in the cost estimate.
- 7. For the upland bank permeable vegetated cap composition 0.5 feet of drain rock overlaid by 1.5 feet of topsoil with a geotextile layer below the drain rock is assumed.
- 8. Material thickness assumptions for the various capping and Enhanced Natural Recovery (ENR) scenarios include:
 - a. Conventional sand cap thickness is assumed to be 2 feet of sand, plus 25 percent overage allowance
 - b. Thick sand cap thickness is assumed to be 4 feet of sand, plus 25 percent overage allowance.
 - c. ENR sand thickness is assumed to be 0.5 feet, plus 50 percent overage allowance.
 - d. Heavy cap armoring is assumed to be a 2-foot thickness of rock applied over 50 percent of Sediment Management Areas (SMAs)-3 to -6 and 25 percent of SMA-11. Habitat mix thickness is assumed to be 0.5 feet and applied over rock armor areas.
 - e. For offshore cap areas where a thin layer of lighter armoring is needed, a 0.5 feet thick layer of gravel erosion protection material is assumed to be placed over the cap area.
- 9. For dredging to facilitate placement of cap material, an average removal depth of 3 feet is assumed. For dredging to facilitate placement of cap material and mass reduction, an average removal depth of 6 feet is assumed. It is assumed that the dredge volume is split equally between land-based excavation and mechanical dredging for SMAs-3 and -4. For SMAs-5 and -10 it is assumed that 90 percent of the removal is by mechanical dredging and 10 percent of the removal is by hydraulic dredging.
- 10. For low-permeability cap areas, it is assumed that an impermeable liner will be placed on 12 inches of bedding sand, overlaid by geotextile layer and 12 inches of sand cover. Gas collection strips are assumed to be placed in the bedding sand with passive treatment in the bank area. It is assumed that the low-permeability cap will be covered with same armor/habitat mix listed in Item 7.
- 11. Zero-valent iron (ZVI) is assumed to be placed by mixing in 12 inches of sand and placing an additional 12 inches of sand on top following installation. Activated carbon (AC) and Organoclay (OC) is assumed to be placed on 12-inch sand bedding layer as mats (Aquagate+ or similar) and covered with 12 inches of sand. Amended cap areas are assumed to be covered with same armor/habitat mix listed in Item 7.
- 12. The following materials contingencies are applied:
 - a. ENR Volume = 50 percent;
 - b. Sand Cap and Amended Cap Volume = 25 percent; and
 - c. Off-Site Disposal Volume = 10 percent.
- 13. Production rate for sediment removal and cap placement is assumed to be 1,000 cubic yards per day.
- 14. Local or regional quarries are assumed for sourcing bank material.



- 15. Seventy-five percent of material removed from tar mound and bank areas is assumed to be disposed at a Subtitle C landfill and 25 percent at an incineration facility. The remaining sediment removed from the GWPS is assumed to be split between Subtitle D landfill (75 percent of material) and Subtitle C landfill (25 percent of material).
- 16. Sediment handling cost includes gravity dewatering on barge, treatment and handling of drained water, transport dewatered sediment by barge to rail facility and transfer of material from barge to rail cars.
- 17. Monitoring for Cap, ENR and Monitored Natural Recovery (MNR) during long-term operation and maintenance is assumed to be at 1, 3, 5, 10, 15, 20, 25 and 30 years from construction.
- 18. Monitoring elements include sediment, surface water, groundwater, and porewater and construction quality, based on the monitoring objective. Activities and costs associated with remedial design sampling or pilot tests are not included in monitoring costs, rather they are included under indirect capital costs.
- 19. Costs for significant infrastructure relocation or replacement associated with capping adjacent to the Harbor Patrol facility are not included in the alternative cost estimates. If needed, these costs would be common to all alternatives and not impact the Disproportionate Cost Analysis.
- 20. Costs associated with additional placement of cap material, including armor and habitat mix replenishment, or repair of impermeable cap or other barriers are included in O&M costs. Major repair costs are assumed for capping and ENR at Year 5 and Year 10 after construction. Repair costs based on 10 percent of capping/ENR remedy capital costs for each event.
- 21. Discount rate of -0.3 percent applied to long-term 0&M costs to evaluate net present value.
- 22. A contingency of 30 percent is applied to the total cost.

REFERENCES

U.S. Environmental Protection Agency. 2000. A Guide to Development and Documenting Cost Estimates During the Feasibility Study.



Table 13B-1

Alternatives Cost Estimate Summary Gas Works Park Site

Seattle, Washington

		Сарі	tal Costs		VI Co			Sum
Alternative	Management Area	Capital Costs (Base)	Capital Costs (with 30% Contingency)	0&M Costs (Base NPV)	0&	M Costs (with 30% Contingency)	_	Capital, O&M, Contingency)
Alternative	GWMA-1, SMA-1, SMA-2	\$ 4,258,500		\$ 3,040,000	\$	3,952,000		9,488,000
	SMA-3	\$ 3,093,000			Ť		_	-,,,,,,,,
	SMA-4	\$ 1,041,000						
	SMA-5	\$ 1,670,000						
	SMA-6	\$ 2,003,000						
	SMA-7	\$ 1,671,000						
1	SMA-8	\$ 614,000						
	SMA-9	\$ 3,123,000		\$ 13,181,000	\$	17,135,300	\$	50,671,300
	SMA-10	\$ 709,500	\$ 922,000					
	SMA-11	\$ 4,919,000						
	SMA-12	\$ 5,568,000						
	SMA-13	\$ 1,386,000						
	SMA-14	\$ -	\$ -					
	Alt 1 Totals =		\$ 39,078,000	\$ 16,220,000	\$	21,090,000	Ś	60,160,000
	GWMA-1, SMA-1, SMA-2	\$ 4,259,000		\$ 3,040,000	+	3,952,000		9,489,000
	SMA-3	\$ 4,512,000		2,010,000	+	2,002,000		
	SMA-4	\$ 1,533,000						
	SMA-5	\$ 2,637,000						
	SMA-6	\$ 2,002,500						
	SMA-7	\$ 1,671,000						
2	SMA-8	\$ 613,500						
-	SMA-9	\$ 3,123,000		\$ 13,630,000	\$	17,719,000	\$	54,908,000
	SMA-10	\$ 709,500						
	SMA-11	\$ 4,918,500						
	SMA-12	\$ 5,500,500						
	OWN 12	Ψ 0,000,000	Ψ 1,101,000					
	SMA-13	\$ 1,386,000	\$ 1,802,000					
	SMA-13 SMA-14	\$ 1,386,000 \$ -						
	SMA-14	\$ -	\$ -	\$ 16,670,000	\$	21,670,000	\$	64,400,000
	SMA-14 Alt 2 Totals =	\$ 32,870,000	\$ 42,731,000		\$	21,670,000 3,952,000		
	SMA-14	\$ 32,870,000 \$ 4,258,500	\$ 42,731,000 \$ 5,536,000		+	21,670,000 3,952,000	\$	
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000		+			
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000		+			
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000		+			
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000		+			
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000		+			
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000		\$		\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000	\$ 3,040,000	\$	3,952,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000	\$ 3,040,000	\$	3,952,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000	\$ 3,040,000	\$	3,952,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000	\$ 3,040,000	\$	3,952,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000	\$ 3,040,000	\$	3,952,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 9,651,000 \$ 1,386,000 \$ -	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000	\$ 3,040,000 \$ 14,640,000	\$	3,952,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-12 SMA-13 SMA-14 Alt 3 Totals =	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 1,386,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 1,802,000 \$ 1,802,000	\$ 3,040,000 \$ 14,640,000 \$ 17,680,000	\$	3,952,000 19,032,000 22,980,000	\$	64,400,000 9,488,000 64,449,000 73,940,000 12,386,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ - \$ 39,200,000 \$ 6,487,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 50,960,000 \$ 8,434,000	\$ 3,040,000 \$ 14,640,000	\$	3,952,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-1, SMA-2	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 5,487,500 \$ 6,487,500 \$ 6,054,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 50,960,000 \$ 3,434,000 \$ 7,870,000	\$ 3,040,000 \$ 14,640,000 \$ 17,680,000	\$	3,952,000 19,032,000 22,980,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-1, SMA-2 SMA-3	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 709,500 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 5,487,500 \$ 6,487,500 \$ 1,522,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 5,934,000 \$ 1,802,000 \$ 1,802,000 \$ 1,802,000 \$ 1,802,000 \$ 1,802,000 \$ 1,802,000 \$ 1,802,000 \$ 1,802,000	\$ 3,040,000 \$ 14,640,000 \$ 17,680,000	\$	3,952,000 19,032,000 22,980,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 5 \$ 39,200,000 \$ 6,487,500 \$ 6,487,500 \$ 1,522,500 \$ 1,617,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 50,960,000 \$ 7,870,000 \$ 1,979,000 \$ 2,102,000	\$ 3,040,000 \$ 14,640,000 \$ 17,680,000	\$	3,952,000 19,032,000 22,980,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-2 SMA-3 SMA-4	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 1,386,000 \$ 1,386,000 \$ 1,522,500 \$ 1,617,000 \$ 2,002,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 50,960,000 \$ 2,102,000 \$ 2,102,000 \$ 2,603,000	\$ 3,040,000 \$ 14,640,000 \$ 17,680,000	\$	3,952,000 19,032,000 22,980,000	\$	9,488,000
3	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-6 SMA-7	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ - \$ 39,200,000 \$ 6,487,500 \$ 6,054,000 \$ 1,522,500 \$ 1,617,000 \$ 2,002,500 \$ 1,671,000	\$ 42,731,000 \$ 5,536,000 \$ 1,424,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 7,870,000 \$ 3,434,000 \$ 2,102,000 \$ 2,102,000 \$ 2,102,000 \$ 2,102,000	\$ 3,040,000 \$ 14,640,000 \$ 17,680,000	\$	3,952,000 19,032,000 22,980,000	\$	9,488,000
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 709,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 39,200,000 \$ 6,487,500 \$ 6,487,500 \$ 1,522,500 \$ 1,617,000 \$ 2,002,500 \$ 1,671,000 \$ 613,500	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 1,802,000 \$ 7,870,000 \$ 2,102,000 \$ 2,102,000 \$ 2,102,000 \$ 2,102,000 \$ 798,000	\$ 3,040,000 \$ 14,640,000 \$ 17,680,000	\$ \$	3,952,000 19,032,000 22,980,000	\$ \$ \$	9,488,000 64,449,000 73,940,000 12,386,000
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-8 SMA-9	\$ 32,870,000 \$ 4,258,500 \$ 2,889,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 1,386,000 \$ 1,522,500 \$ 1,522,500 \$ 1,617,000 \$ 2,002,500 \$ 1,671,000 \$ 4,398,000	\$ 42,731,000 \$ 5,536,000 \$ 3,756,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 50,960,000 \$ 2,102,000 \$ 2,102,000 \$ 2,102,000 \$ 2,172,000 \$ 798,000 \$ 798,000	\$ 14,640,000 \$ 17,680,000 \$ 3,040,000	\$ \$	3,952,000 19,032,000 22,980,000 3,952,000	\$ \$ \$	9,488,000 64,449,000 73,940,000 12,386,000
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-9 SMA-9 SMA-9 SMA-10	\$ 32,870,000 \$ 4,258,500 \$ 1,095,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ \$ 39,200,000 \$ 6,487,500 \$ 6,054,000 \$ 1,522,500 \$ 1,617,000 \$ 1,671,000 \$ 4,398,000 \$ 715,500	\$ 42,731,000 \$ 5,536,000 \$ 1,424,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 5,934,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 7,870,000 \$ 3,434,000 \$ 2,102,000 \$ 2,102,000 \$ 2,102,000 \$ 2,102,000 \$ 3,930,000 \$ 930,000	\$ 14,640,000 \$ 17,680,000 \$ 3,040,000	\$ \$	3,952,000 19,032,000 22,980,000 3,952,000	\$ \$ \$	9,488,000 64,449,000 73,940,000 12,386,000
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-10 SMA-10 SMA-10 SMA-10 SMA-10	\$ 32,870,000 \$ 4,258,500 \$ 1,095,000 \$ 1,668,000 \$ 1,668,000 \$ 4,564,500 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 1,386,000 \$ 1,522,500 \$ 1,617,000 \$ 1,617,000 \$ 1,671,000 \$ 4,398,000 \$ 715,500 \$ 4,918,500	\$ 42,731,000 \$ 5,536,000 \$ 1,424,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 1,802,000 \$ 7,870,000 \$ 1,979,000 \$ 2,102,000 \$ 2,102,000 \$ 2,172,000 \$ 798,000 \$ 930,000 \$ 930,000	\$ 14,640,000 \$ 17,680,000 \$ 3,040,000	\$ \$	3,952,000 19,032,000 22,980,000 3,952,000	\$ \$ \$	9,488,000 64,449,000 73,940,000 12,386,000
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals =	\$ 32,870,000 \$ 4,258,500 \$ 1,095,000 \$ 1,095,000 \$ 1,668,000 \$ 2,002,500 \$ 4,564,500 \$ 1,323,000 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 1,386,000 \$ 1,522,500 \$ 1,617,000 \$ 1,617,000 \$ 1,671,000 \$ 4,398,000 \$ 4,398,000 \$ 715,500 \$ 4,918,500 \$ 5,568,000	\$ 42,731,000 \$ 5,536,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 1,720,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 7,870,000 \$ 1,979,000 \$ 2,102,000 \$ 2,102,000 \$ 2,172,000 \$ 798,000 \$ 798,000 \$ 930,000 \$ 7,238,000	\$ 14,640,000 \$ 17,680,000 \$ 3,040,000	\$ \$	3,952,000 19,032,000 22,980,000 3,952,000	\$ \$ \$	9,488,000 64,449,000 73,940,000
	SMA-14 Alt 2 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-10 SMA-11 SMA-12 SMA-13 SMA-14 Alt 3 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-10 SMA-10 SMA-10 SMA-10 SMA-10	\$ 32,870,000 \$ 4,258,500 \$ 1,095,000 \$ 1,668,000 \$ 1,668,000 \$ 4,564,500 \$ 4,729,500 \$ 709,500 \$ 4,918,500 \$ 9,651,000 \$ 1,386,000 \$ 1,386,000 \$ 1,522,500 \$ 1,617,000 \$ 1,617,000 \$ 1,671,000 \$ 4,398,000 \$ 715,500 \$ 4,918,500	\$ 42,731,000 \$ 5,536,000 \$ 1,424,000 \$ 2,168,000 \$ 2,603,000 \$ 1,720,000 \$ 1,720,000 \$ 6,148,000 \$ 922,000 \$ 6,394,000 \$ 12,546,000 \$ 1,802,000 \$ 7,870,000 \$ 1,979,000 \$ 2,102,000 \$ 2,102,000 \$ 2,172,000 \$ 798,000 \$ 798,000 \$ 930,000 \$ 7,238,000	\$ 14,640,000 \$ 17,680,000 \$ 3,040,000	\$ \$	3,952,000 19,032,000 22,980,000 3,952,000	\$ \$ \$	9,488,000 64,449,000 73,940,000 12,386,000



	GWMA-1, SMA-1, SMA-2	\$	6,487,500	\$	8,434,000	\$	3,040,000	\$	3,952,000	\$	12,386,000
	SMA-3	\$	4,431,000	\$	5,760,000						
	SMA-4	\$	1,522,500	\$	1,979,000						
	SMA-5	\$	1,617,000	\$	2,102,000						
	SMA-6	\$	2,002,500		2,603,000						
	SMA-7	\$	4,564,500		5,934,000						
5	SMA-8	\$		\$	1,720,000						
ÿ						\$	14,243,000	\$	18,515,900	\$	60,694,900
	SMA-9	\$	4,398,000		5,717,000						
	SMA-10	\$	715,500	\$	930,000						
	SMA-11	\$	4,918,500		6,394,000						
	SMA-12	\$		\$	7,238,000						
	SMA-13	\$	1,386,000	\$	1,802,000						
	SMA-14	\$	-	\$	-						
	Alt 5 Totals =	\$	38,930,000	\$	50,609,000	\$	17,280,000	\$	22,470,000	\$	73,080,000
	GWMA-1, SMA-1, SMA-2	\$	6,487,500	\$	8,434,000	\$	3,040,000	\$	3,952,000	\$	12,386,00
	SMA-3	\$	4,431,000	\$	5,760,000						
	SMA-4	\$	1,770,000	\$	2,301,000						
	SMA-5	\$	1,668,000	\$	2,168,000						
	SMA-6	\$	2,002,500		2,603,000						
	SMA-7	\$	4,564,500		5,934,000						
6	SMA-8	\$	619,500	\$	805,000						
	SMA-9	\$		\$	6,148,000	\$	14,231,000	\$	18,500,300	\$	60,583,30
	SMA-10	\$	715,500	\$	930,000						
					,						
	SMA-11	\$	4,918,500		6,394,000						
	SMA-12	\$		\$	7,238,000						
	SMA-13	\$	1,386,000		1,802,000						
	SMA-14	\$	-	\$	-						
	Alt 6 Totals =	\$	38,860,000	\$	50,518,000	\$	17,270,000	\$	22,450,000	\$	72,970,000
	GWMA-1, SMA-1, SMA-2	\$	6,487,500	\$	8,434,000	\$	3,040,000	\$	3,952,000	\$	12,386,00
	SMA-3	\$	4,431,000	\$	5,760,000						
	SMA-4	\$	1,555,500	\$	2,022,000						
	SMA-5	\$	1,668,000	\$	2,168,000						
	SMA-6	\$	3,540,000	\$	4,602,000						
	SMA-7	\$	4,564,500	\$	5,934,000						
7	SMA-8	\$	1,323,000	\$	1,720,000						
	SMA-9	\$	4,729,500	\$		\$	15,217,000	Φ.	19,782,100		69,900,10
	SMA-10	\$		Ψ	6,148,000			Ф	19,782,100	\$	03,300,10
			786.000					Þ	19,782,100	\$	03,300,10
	SMA-11		786,000 4.918.500	\$	1,022,000			Ą	19,762,100	\$	03,300,10
	SMA-12	\$	4,918,500	\$	1,022,000 6,394,000			A	19,782,100	\$	03,300,10
	SMA-12	\$	4,918,500 9,651,000	\$ \$	1,022,000 6,394,000 12,546,000			A	19,782,100	\$	03,300,10
	SMA-12 SMA-13	\$ \$	4,918,500	\$ \$ \$	1,022,000 6,394,000			A	19,782,100	\$	03,300,10
	SMA-12 SMA-13 SMA-14	\$ \$ \$	4,918,500 9,651,000 1,386,000	\$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000	*	10.000.000				
	SMA-12 SMA-13 SMA-14 Alt 7 Totals =	\$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000	\$	18,260,000	\$	23,730,000	\$	82,290,000
	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2	\$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000 6,487,500	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000	\$			23,730,000		82,290,000
	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3	\$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000 6,487,500 4,431,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000			\$	23,730,000	\$	82,290,000
	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2	\$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000 6,487,500	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000			\$	23,730,000	\$	82,290,000
	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3	\$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000 6,487,500 4,431,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000			\$	23,730,000	\$	82,290,000
	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4	\$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000 6,487,500 4,431,000 1,555,500	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000			\$	23,730,000	\$	82,290,000
	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 2,168,000			\$	23,730,000	\$	82,290,000
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 - 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 2,168,000 4,602,000	\$	3,040,000	\$ \$	23,730,000 3,952,000	\$ \$	82,290,000 12,386,00
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000 4,564,500	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 2,168,000 4,602,000 5,934,000			\$ \$	23,730,000	\$ \$	82,290,00 0 12,386,00
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000 4,564,500 1,323,000 4,729,500	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 2,168,000 4,602,000 5,934,000 1,720,000	\$	3,040,000	\$ \$	23,730,000 3,952,000	\$ \$	82,290,000 12,386,00
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000 4,564,500 1,323,000 4,729,500 786,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 2,168,000 4,602,000 5,934,000 1,720,000 6,148,000 1,022,000	\$	3,040,000	\$ \$	23,730,000 3,952,000	\$ \$	82,290,000 12,386,00
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000 4,564,500 1,323,000 4,729,500 786,000 4,918,500	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 2,168,000 4,602,000 5,934,000 1,720,000 6,148,000 1,022,000 6,394,000	\$	3,040,000	\$ \$	23,730,000 3,952,000	\$ \$	82,290,000 12,386,00
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000 4,564,500 1,323,000 4,729,500 786,000 4,918,500 9,651,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 2,168,000 4,602,000 5,934,000 1,720,000 6,148,000 1,022,000 6,394,000 12,546,000	\$	3,040,000	\$ \$	23,730,000 3,952,000	\$ \$	82,290,000 12,386,00
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12 SMA-13	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000 4,564,500 1,323,000 4,729,500 786,000 4,918,500 9,651,000 5,281,500	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 8,434,000 5,760,000 2,022,000 2,168,000 4,602,000 5,934,000 1,720,000 6,148,000 1,022,000 6,394,000 12,546,000 6,866,000	\$	3,040,000	\$ \$	23,730,000 3,952,000	\$ \$	82,290,000 12,386,00
8	SMA-12 SMA-13 SMA-14 Alt 7 Totals = GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5 SMA-6 SMA-7 SMA-8 SMA-9 SMA-10 SMA-11 SMA-12	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4,918,500 9,651,000 1,386,000 45,040,000 6,487,500 4,431,000 1,555,500 1,668,000 3,540,000 4,564,500 1,323,000 4,729,500 786,000 4,918,500 9,651,000	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	1,022,000 6,394,000 12,546,000 1,802,000 58,552,000 8,434,000 5,760,000 2,022,000 4,602,000 5,934,000 1,720,000 6,148,000 1,022,000 6,394,000 12,546,000 6,866,000 4,007,000	\$	3,040,000	\$ \$	23,730,000 3,952,000	\$ \$	82,290,000 12,386,000 81,543,800

Notes

- 1. Estimates represent order-of-magnitude within a range of -30 percent to +50 percent consistent with USEPA Feasibility Study cost estimating guidance. Costs are in 2021 dollars.
- 2. All cost values are estimates, and should not be interpreted as final construction costs.
- 3. NPV = net present value



Table 13B-2

Unit Costs Used for Detailed Cost Estimates Gas Works Park Site Seattle, Washington

Seattle, Washington						
				2021 Unit Cost		
Item	Unit	Unit Cost	Year	Conversion ¹	Source/Assumptions	
Direct Capital Costs General Site Construction Elements						
Upland earthwork temporary controls (erosion control, temporary facilities, access controls)	Is			\$ 100,000	Professional judgment and experience on other similar projects.	
Clear and Grub trees up to 12" diameter	acre	\$11,761.68	2020	\$ 13,546	2020 RS Means Heavy Construction Cost Data. Increased unit cost by 10% to include management	
Post-construction upland survey	each	\$3,100	2020	\$ 3,571	of organic waste. 2020 RS Means Heavy Construction Cost Data. Approx. \$3,100/acre for topographic survey.	
		70,200			Upland area is less than 1 acre.	
Air and Dust Monitoring	day			\$ 500	Professional judgment and experience on other similar projects. Includes subcontractor and analytical costs for perimeter monitoring.	
Excavation (Upland) Soil Excavation (upto 15 feet)	су	\$13	2020	\$ 14	Vendor quote (Wyser Construction) and experience on other similar projects. Includes screening	
		41 5	2020	·	and handling of oversized debris encountered during excavation.	
Dewatering System - Shallow Excavation	Is			\$ 50,000	Professional judgment and experience on other similar projects. Includes dewatering and handling for shallow excavations (less than 15 ft bgs). Assume drainage ditch, sump hole construction with	
On-site stockpiling and management of excavated material	су			\$ 5	pumping and handling/management of water. Experience on other similar projects.	
Transport/Disposal (Soil/Water) Soil unit weight conversion (in-place volume)	ton/cy	'	1	1.4	Average unit weight (in-place volume) based on prior testing in arsenic impact area near eastern	
Soil unit weight conversion (in-place volume)	ton/ cy			1.4	shoreline; average accounts for differences in unit weights between unsaturated and saturated	
Transport (truck/train) and dispose soil to Subtitle D landfill	ton	\$60	2018	\$ 69	soil. Vendor quote (Waste Management) for permitted facility in Washington. Includes truck liner and	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	ton	\$175	2018	\$ 201	Considered non-hazardous due to TCLP exemption for MGPs. Disposal at permitted Chem WM Subtitle C in Oregon. Disposal \$90/ton, plus	
					rail-transporation and liner cost to Oregon \$800/container. Unit cost ~ \$175/ton.	
Transport (truck), incinerate and dispose soil at hazardous waste facility in (Aragonite Utah)	, ton	\$878	2018	\$ 1,008	Vendor quote for permitted facilities in Aragonite, Utah. Basis for quote is \$650/ton for incineratio and disposal and \$228/ton transport by truck.	
Upland Backfilling and Capping						
Rough grade for cap surface preparation	Is	3094.03	2020	\$ 3,240	Based on 2020 RS Means.	
Procure and Install Geotextile	sy	2.85	2020	\$ 3	Based on an average contractor bid price on another project (Kite Hill). Assume 10 ounce weight, non-woven needle punched fabric.	
Cap drainage layer - import, place, compact	су	45	2014		Vendor quote (Wyser Construction) and project experience from Kite Hill. Assume Type 17 Bank	
Procure and Place Topsoil Hydroseeding	cy sy	40	2014 2014		Vendor quote (Wyser Construction) and project experience from Kite Hill. Vendor quote (Wyser Construction) and project experience from Kite Hill.	
Shoreline Restoration	ls				Professional judgment. Assumes revegetation in lake perimeter areas affected by construction;	
In-Situ Chemical Fixation					cost includes restoration design and is based on similar effort scope costs.	
Mobilization and Demobilization Bench Scale/Pilot Testing	each	\$12,000 \$40,000	2019 2019		Vendor quote (Isotec). Vendor quote (Isotec). Bench testing to evalauate treability and design factors.	
ISCF Reagent Application	ls	\$40,000	2019		Based on PA IA costs (2017 to 2019). Includes labor, equipment, injection point drilling and	
					reagent costs. Approx. \$300,000 for injection well (~36 wells) and MW drilling and piping infrastructure. Approx. \$60,000 per injection event for reagent injection (includes labor and materials). Total cost ~ \$500,000. Assume \$300,000 for GWMA·1 due to reduced scope.	
Process Monitoring	Is			\$ 120,000	Professional judgment and experience from PA IA. Assume 2 to 3 new monitoring wells for installation and monitoring/analytical costs (total and dissolved arsenic, iron). Approximate PA IA	
					monitoring cost was \$25,000 per event. Assume 4 events. Assume \$10,000 for new monitoring wells.	
Sediment Removal					weils.	
Sediment excavation using land-based excavation equipment	су	\$39	2016	\$ 49	Vendor quote (Great Lakes Env and Infrastructure). Excavate using equipment placed in upland;	
					stockpile in upland. Includes silt curtain for in-water BMP. Cost includes a contingency for additional water quality controls in the event NAPL is encountered during removal.	
Shoring and/or coffer dam install for excavation in lakeshore area	Is		2021	\$ 325,000	Vendor quote (Portadam Inc.). Based on use of Portadam coffer dam system. Cost includes installation, dismantling, and 2-months rental.	
Handling and dewatering of sediment from land-based excavation	су			\$ 15	Professional judgment and experience on other smilar projects.	
Sediment removal by hydraulic dredging (Suction head)	су	\$47	2016	\$ 60	Vendor quote (Great Lakes Env and Infrastructure). Increased the unit cost to account for specialt dredges that may be required to handle site conditions. Assumes 70% removal of water by volume	
Developing of hydrovicelly decaded as discost		\$11	2016	\$ 14	Newdown to A County I also Forward Infrastructural based on any significant Codiments As he	
Dewatering of hydraulically dredged sediment	су	2 11	2016	\$ 14	Vendor quote (Great Lakes Env and Infrastructure) based on previous projects. Sediments to be dried via geotubes in containment area to a degree to allow for transport and disposal.	
		400	0046	40		
Sediment removal by mechanical dredging (barge-mounted)	су	\$38	2016	\$ 48	Estimate based on vendor quote (Great Lakes Env and Infrastructure) and cost for similar recent completed projects. Includes silt curtain for water quality control. Cost includes a contingency for	
Gravity dewatering on the barge	су			\$ 10	additional water quality controls in the event NAPL is encountered during removal. Professional judgment and experience on other similar projects. Assume dewatering of	
					mechanically dredged sediment on material barges.	
Handling of water drained from excavated sediment	day			\$ 10,000	Professional judgment and experience on other similar projects. Estimate for treatment equipmer collection, treatment, testing, handling, and discharge of water (to the Lake) drained from	
	da			\$ 6.000	mechanically dredged sediment.	
Construction Best Management Practices (BMPs) Maintenance and Monitoring	day			\$ 6,000	Professional judgment and experience on other similar projects. Includes maintenance of BMPs, survey boat, labor and equipment for bathymetric survey and water quality testing during	
Sediment unit weight conversion (in-place volume)	ton/cy			13	construction. Professional judgment. Average unit weight (in-place volume).	
Transload/Transport/Disposal (Sediment)	toriy oy					
Stockpile and dewatering area setup and removal Barge transport to rail facility	ls ton				Professional judgment and experience on other similar projects. Estimate for transporting dewatered sediment on material barge from work area to the WM	
					transload facility in the Duwamish waterway. Estimate based on professional judgment and experience on similar projects.	
In-Water Backfilling and Capping			<u> </u>		experience of similar projects.	
Sediment debris sweep and disposal	acre			\$ 30,000	Professional judgment and experience on other similar projects. Prepares existing surface for cap Assumes no major obstructions are encountered.	
Removal of docks and large obstructions	Is			\$ 100,000	Professional judgment and experience on other similar projects. Assumed to cover costs for major	
Procure and place enhanced natural recovery (ENR) layer	су	\$36	2017	\$ 44	obstructions (sunken boats, large debris) in isolated areas. Vendor quote. Assume placement of sand in two separate thin lifts with 6-inch final thickness	
				·	(includes 10% increase for thin cap placement in lifts on soft sediment).	
Procure and place sand backfill/cap	ton	\$37	2017		Based on vendor quote and experience on similar projects. Material imported from an upland source.	
Procure and place geocomposite gas collection layer	lf	\$4	2016	\$ 6	Vendor quote (Layfield USA Corp) for Geo-Comp 5-2-6. Includes labor and material costs.	
Procure and place Impermeable Liner	sf	\$1	2016	\$ 2	Vendor quote (Layfield USA Corp) for Enviroliner 7040HD. Incldes labor and material cost for dry	
Amended cap media: Organoclay PM-199	lb	\$2	2016	\$ 2	installation. Vendor quote (AquaBlok). Application rate varies; determined through cap modeling.	
Amended cap media: Activated Carbon	lb	\$1	2016	\$ 2	Vendor quote (AquaBlok). Application rate varies; determined through cap modeling.	
Amended cap media: Zero-Valent Iron Prepare amended cap blend	lb cy	\$2 \$5	2016 2016		Vendor quote (AquaBlok). Application rate varies; determined through cap modeling. Vendor quote(AquaBlok). Mix sand/organoclay blend in upland location to prepare for placement.	
Amended Cap placement	су	\$40	2016	\$ 51	Estimate based on previous project costs.	
Purchase and Install Reactive Core Mat TM Organoclay	sf	\$10	2016	\$ 13	Based on vendor quote (Cetco) and previous projects. RCM mat standard dimension 15 feet by 10 feet roll with 1 cm thickness. Material cost ($\$3/sf$) + Installation cost ($\$7/sf$) = $\$10/sf$.	
Purchase and Install Reactive Core Mat TM Granular Activated Carbon	sf	\$10	2016	\$ 13	Based on vendor quote (Cetco) and previous projects. RCM mat standard dimension 15 feet by 10 feet roll with 1 cm thickness. Material cost (\$3/sf) + Installation cost (\$7/sf) = \$10/sf.	
Purchase and place Aquagate TM with Powdered Activated Carbon	sf	\$10	2021	\$ 10	Vendor quote (AquaBlok). Unit cost based on achieving target cap thickness of 3 inches. Assume	
					5% Powdered Activated Carbon by weight. Material cost (\$7.00/sf) + Installation cost (\$3.00/sf) = \$10/sf.	
Purchase and place Aquagate [™] with Organoclay	sf	\$25	2021	\$ 25	Vendor quote (AquaBlok). Unit cost based on achieving target cap thickness of 4 inches. Assume	
	1			<u> </u>	30% organoclay by weight. Material cost (\$22/sf) + Installation cost (\$3/sf) = \$25/sf.	



				2021 Unit Cost	
				/	
Item	Unit	Unit Cost	Year	Conversion	Source/Assumptions
Procure and place armor stone for erosion protection	ton	48	2013	\$ 70	Based on an average contractor bid price on a another project. Material imported from an upland source and placed in intertidal zone using upland-based equipment
Procure and place fish mix on armor rock to fill interstitial voids	су	61.67	2016	\$ 78	Based on an average contractor bid price on a another project. Material imported from an upland source, tranloaded onto a barge and placed using marine barge-based equipment.
Procure and place 6-inch layer of pea gravel for armor	су			\$ 27	Estimate based on experience on similar projects.
Stormwater and Stockpile Water Management					
Stormwater collection, water collection from material stockpile areas (from	Is			\$ 100,000	Professional judgment based on recently completed projects. Costs include mobilization, setup,
dewatering), treatment, and discharge system during construction Miscellaneous	<u> </u>		<u> </u>		rental, demobilization, treatment and discharge.
Institutional Controls/Restrictive Covenants Preparation	Is			\$ 75,000	Professional judgment based on recently completed projects. Initial costs for activities used to establish or setup institutional controls. Assume annual costs applied Year 1 through Year 30.
Institutional Controls - annual cost	Is			\$ 25,000	Professional judgment based on recently completed projects. Annual costs for activities performed on a regular basis to monitor and maintain the institutional controls.
Net Present Value Multipliers		•		•	
Net Present Value Discount Rate	-0.3%				Based on Real 30-year discount rate published in November 2020 Office of Management and Budget Circular No. A-94.
				Equal Annual	
				Payment Multiplier ²	Single Payment Multiplier ³
	Years			1.00	1.00
	2	-		2.01	1.01
	3	-		3.02	1.01
	1	-		4.03	1.01
	-	-	-	5.05	1.02
Net Dresent Value Multiplians for acreal payment agrics	5				1.02
Net Present Value Multipliers for equal payment series	7	1		6.06	1.02
	7	1		7.08	
	8			8.11	1.02
	9			9.14	1.03
	10	1		10.17	1.03
	15	1		15.37	1.05
	20	1		20.64	1.06
	25			26.00	1.08
	30			31.44	1.09
Annual Groundwater Monitoring					
Groundwater sampling labor	well			\$ 500	Professional judgment and experience on other similar projects. Assume 2 field staff for completing the work.
Groundwater Sample Chemical Analysis	well			\$ 620	Recent project costs. Includes analysis for BETX, SIM PAHs, Arsenic, Sulfate, Alkalinity, TDS, Chloride, Nitrate, Ions and Total Fe and Ferrous Fe.
Data analysis, management and reporting	Is			\$ 100,000	Recent project costs.
Upland Cap Monitoring					
Cap monitoring, maintenance, and reporting - annual cost Sediment Monitoring and O&M	Is			\$ 30,000	Professional judgment and experience on other similar projects.
Sediment cap operation and maintenance monitoring and reporting	acre			\$ 20,000	Professional judgment and experience on other similar projects. Includes labor, equipment, sediment sampling, analytical costs and bathymetric survey for long-term operation and maintenance monitoring. Assume monitoring in Year 1,3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes armor and habitat mix replenishment.
ENR operation and maintenance monitoring and reporting	acre			\$ 12,500	Professional judgment and experience on other similar projects. Includes labor, equipment, sediment sampling, analytical costs and bathymetric survey for long-term operation and maintenance monitoring. Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event	%			10%	Periodic major repair of cap/ENR areas. Assume repair in Year 5, and 10 after active remedy construction. Based on percent of cap/ENR remedy capital costs.
MNR operation and maintenance monitoring and reporting	acre			\$ 10,000	Professional judgment and experience on other similar projects. Includes labor, equipment, sediment sampling, analytical costs and bathymetric survey for long-term operation and maintenance monitoring. Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 years after active remedy construction.
Unit Conversion	TONO (C)	1	1	1 .=	Drefessional independent
Conversion from CY to Tons for Contaminated Material	TONS/CY				Professional judgment.
Conversion from CY to Tons for Imported Loose Sand or sand with Gravel	TONS/CY		 		Professional judgment.
Conversion from CY to Tons for Imported Gravel/Rock	TONS/CY	1	1	1.6	Professional judgment.
Mahilization (demobilization	0/ of TDO	1		400	Indirect percentages based on EDA 2000 suidenes (EDA 2000 A Cuide to Developing
Mobilization/demobilization	% of TDC	1	1		Indirect percentages based on EPA 2000 guidance (EPA, 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. OSWER 9355.0-75
Remedial design	% of TDC	1		20%	and recent project experience.
Project management (PM)	% of TDC	1	1		
Construction management (CM)	% of TDC	1	1	10%	
Ecology Oversight	% of TDC	1	<u> </u>	2%	
Contingency	% of TDC	 	 	30%	
Annual Inflation Rate Total Indirect Capital Costs	% of TDC			4.7% 50%	Apply mob/demob, remedial design, PM, CM, and ecology oversight to sum of capital direct costs.
ndirect Costs - 0&M Expenses	0/ -/	1	1	1	Latin to a control of the control of
Project management	% of TDC	1		10%	Indirect percentages based on EPA 2000 guidance (EPA, 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. OSWER 9355.0-75)
Construction management	% of TDC	1	1	5% 2%	and recent project experience.
Ecology Oversight Contingency	% of TDC % of TDC	1	1	30%	
Contingency Total Indirect O&M Costs		+	 		Apply PM CM and ecology oversight to sum of Q&M direct costs

Notes:

- 1. Costs shown represent labor, equipment and materials inclusive of overhead and profit.
- 2. All cost values are estimates, and should not be interpreted as final construction costs.
- 3. Cost Estimate Guidance: A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. EPA 540-R-00-002. OSWER 9355.0-75, EPA 2000.

Total Indirect O&M Costs % of TDC

- 4. Estimates represent order-of-magnitude within a range of -30 percent to +50 percent consistent with USEPA Feasibility Study cost estimating guidance. Costs are in 2021 dollars
- 5. Cost estimates based on professional judgment, literature reference, RS Means Cost Data, vendor quote and experience on similar projects.
- edial design, project managei ment, and ecology oversight), contingency, and operatior

17% Apply PM, CM and ecology oversight to sum of O&M direct costs.

- 7. Mobilization/demobilization includes contractor submittals, job adminstration/management, mobilizing labor, equipment and materials, field quality control testing, site preparation, baseline sampling (prior to construction) and demobilization.
- 8. Remedial design includes sampling plans, work plans, design support studies (geotechnical/seismic, vessel scour) pre-design sampling, engineering survey, permitting, plans and specifications, engineers estimate, bid documents and contracting support studies. 9. Project management includes meetings, planning, coordination, cost and performance reporting.
- 10. Construction management includes field oversight, traffic and vessel navigation control, submittal review, change order review, design modifications, construction schedule tracking and construction completion report.
- 11. Long-term operation, monitoring, maintenance and inspection (O&M) costs are presented as the Net Present Value (NPV) estimated over a 30 year period using a discount rate of -0.3%. O&M costs include project management and construction
- 12. Contingency applied to the following material volumes: ENR Volume = 50%; Sand Cap Volume = 25%; Upland Backfill Volume = 10%, Off-Site Disposal Volume = 10%.

The following acronyms are used on Tables 13A-3 through 13A-13:

cy = cubic yard

ENR = enhanced natural recovery

Ib = pounds If = linear feet

Is = lump sum

MNR = monitored natural recovery

NPV = net present value

O&M = operation and maintenance

sf = square foot

ISCF = In-Situ Chemical Fixation

sy = square yard

TDC = total direct capital cost



Table 13B-3

Alternative 1
Gas Works Park Site
Seattle, Washington

Josephinian	Qua	intity	(Cost	
Description		Unit	Unit Cost	Total Cost	Notes
Capital Costs (Direct and Indirect)					p. 10100
GWMA-1, SMA-1 and SMA-2					
Upland earthwork temporary controls (erosion control, temporary facilities,					
access controls)	1	ls	\$ 100,000	\$ 100,000	Assumed to apply to all upland work.
					Assume perimeter and work area dust monitoring using hand-held real-time
Air and Dust Monitoring	60	day	\$ 500	\$ 30,000	dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	ls	\$ 150,000	\$ 150,000	
	_		,	,	Costs include mobilization, setup, rental, demobilization, treatment and
Stormwater collection, water collection from material stockpile areas (from	1	Is	\$ 100,000	\$ 100,000	discharge.
dewatering), treatment, and discharge system during construction					
Clear and Grub trees up to 12" diameter	1	acre	\$ 13,546	\$ 14,000	
Soil Excavation (upto 15 feet)	2,452	су	\$ 14	\$ 34,000	Cost includes screening and handling of oversized debris encountered duri
	_,	• ,		, ,,,,,,	excavation.
Dewatering System - Shallow Excavation	1	Is	\$ 50,000	\$ 50,000	Assumed to apply to tar mound excavation work. Includes water collection
On site steelesiling and management of everysted material	2,452	01/	\$ 5	\$ 12,000	and off-site management.
On-site stockpiling and management of excavated material	2,452	су	a 5	\$ 12,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	2,832	ton	\$ 201	\$ 569,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C
landfill	2,002	torr	201	000,000	landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
					Assume 25% soil from tar mound excavation is classified as hazardous and
Transport (truck), incinerate and dispose soil at hazardous waste facility in	944	ton	\$ 1,008	\$ 952,000	requires incineration. Based on soil unit weight conversion (1.4 tons/cy) fo
(Aragonite, Utah)					the site.
Rough grade for cap surface preparation	1	ls	\$ 3,240	\$ 3,000	Cap area to be rough graded is less than 1 acre.
Procure and Install Geotextile	3,582	sy	\$ 2.98	\$ 11,000	
Cap drainage layer - import, place, compact	657	су	\$ 63		Assume 6 inch thick layer of drainage rock (i.e, Type 17).
Procure and Place Topsoil	1,970	су	\$ 56		Assume 1.5 ft thick layer of topsoil.
Hydroseeding	3,582	sy	\$ 3	\$ 11,000	
Post-construction upland survey	1	each	\$ 3,571	\$ 4,000	Final as-built survey for upland construction.
Shoreline Restoration	1	ls	\$ 100,000 \$ 13,155	\$ 100,000 \$ 53.000	In City Chamical Fivation (ICCF) make and demak
Mobilization and Demobilization	4	each	\$ 13,155	\$ 53,000	In-Situ Chemical Fixation (ISCF) mob and demob.
ISCF Reagent Application	1	Is	\$ 300,000	\$ 300,000	Includes labor, equipment, injection point drilling and reagent costs. Assur 4 events.
					- cvento.
Process Monitoring	1	Is	\$ 120,000	\$ 120,000	ISCF process monitoring, new wells, sample collection and analysis.
					Assumed cost for initial setup of institutional controls for uplands and in-
Institutional Controls/Restrictive Covenants Preparation	1	ls	\$ 75,000	\$ 75,000	water work.
Direct Capital Cost Subtotal			•	\$ 2,839,000	
Indirect Capital Cost		% of TDC	50%	\$ 1,419,500	
Total Capital Cost				\$ 4,258,500	
SMA-3					
Sediment debris sweep and disposal	1.0	acre	\$ 30,000	\$ 30,000	
Removal of docks and large obstructions	0	ls	\$ 100,000	\$ -	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$ 325,000	\$ 163,000	Assume costs are split between SMA-3 and SMA-4
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Sediment excavation using land-based excavation equipment	4,889	су	\$ 49	\$ 240,000	
Handling and dewatering of sediment from land-based excavation	4,889	су	\$ 15	\$ 73,000	
	10	day	\$ 10,000	\$ 100.000	
Handling of water drained from everyated and impart	10		2 10.000	\$ 100,000	
Handling of water drained from excavated sediment		uay			
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	1,681	ton	\$ 201	\$ 338,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	,	ton	\$ 201	,	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	1,681 5,042 9,333	-		\$ 348,000	Assume 2 ft and 4 ft thick cap.
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill	5,042 9,333	ton ton ton	\$ 201 \$ 69 \$ 45	\$ 348,000 \$ 420,000	,
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap	5,042	ton	\$ 201 \$ 69	\$ 348,000 \$ 420,000	Assume 2 ft and 4 ft thick cap. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and	5,042 9,333	ton ton ton	\$ 201 \$ 69 \$ 45	\$ 348,000 \$ 420,000 \$ 106,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and Monitoring	5,042 9,333 18	ton ton ton day	\$ 201 \$ 69 \$ 45 \$ 6,000	\$ 348,000 \$ 420,000 \$ 106,000 \$ 181,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection	5,042 9,333 18 2,590 809	ton ton ton day	\$ 201 \$ 69 \$ 45 \$ 6,000	\$ 348,000 \$ 420,000 \$ 106,000 \$ 181,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Assume a thickness of 2 feet.
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Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtotal Indirect Capital Cost	5,042 9,333 18 2,590 809	ton ton day ton cy	\$ 201 \$ 69 \$ 45 \$ 6,000 \$ 70	\$ 348,000 \$ 420,000 \$ 106,000 \$ 181,000 \$ 63,000 \$ 2,062,000 \$ 1,031,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Assume a thickness of 2 feet.
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Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtotal Indirect Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	5,042 9,333 18 2,590 809 0.3 0 1 1,378 1,378 5 474 1,421 2,087 4	ton ton ton day ton cy % of TDC acre Is Is cy cy day ton ton day	\$ 201 \$ 69 \$ 45 \$ 6,000 \$ 70 \$ 78 50% \$ 30,000 \$ 100,000 \$ 125,000 \$ 201 \$ 69 \$ 45 \$ 6,000	\$ 348,000 \$ 420,000 \$ 106,000 \$ 181,000 \$ 63,000 \$ 2,062,000 \$ 1,031,000 \$ 3,093,000 \$ - \$ 163,000 \$ 68,000 \$ 21,000 \$ 50,000 \$ 95,000 \$ 94,000 \$ 27,000 \$ 18,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Assume a thickness of 2 feet. Assume a thickness of 6 inches. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft and 4 ft thick cap. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
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Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtotal Indirect Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	5,042 9,333 18 2,590 809 0.3 0 1 1,378 1,378 5 474 1,421 2,087 4 735 230	ton ton ton day ton cy % of TDC acre Is Is cy cy day ton ton ton day ton	\$ 201 \$ 69 \$ 45 \$ 6,000 \$ 70 \$ 78 50% \$ 30,000 \$ 100,000 \$ 100,000 \$ 201 \$ 69 \$ 45 \$ 6,000 \$ 70	\$ 348,000 \$ 420,000 \$ 106,000 \$ 181,000 \$ 63,000 \$ 2,062,000 \$ 1,031,000 \$ 3,093,000 \$ - \$ 163,000 \$ 68,000 \$ 21,000 \$ 50,000 \$ 95,000 \$ 94,000 \$ 27,000 \$ 18,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Assume a thickness of 2 feet. Assume a thickness of 6 inches. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft and 4 ft thick cap. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Assume a thickness of 2 feet.



	1 0	4!4		_	4	
Description	Number Vua	Unit	Unit Cost		ost Total Cost	Notes
Description SMA-5	Number	OIIIC	Onit Cost		Total Cost	Notes
Sediment debris sweep and disposal	0.6	acre	\$ 30,0	00	\$ 18,000	
Removal of docks and large obstructions	1	ls	\$ 100,0	_	,	For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	289	су	\$	60	\$ 17,000	Diver assisted dredging around shoreline structures
Dewatering of hydraulically dredged sediment	289	су		14	\$ 4,000	
Sediment removal by mechanical dredging (barge-mounted)	2,600	су		48	\$ 124,800	
Gravity dewatering on the barge Barge transport to rail facility	2,600 3,972	cy ton	\$	10 5	\$ 26,000 \$ 20,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	3,912	ton	Φ	5	\$ 20,000	
landfill	993	ton	\$ 2	01	\$ 200,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$	69	\$ 206,000	
Procure and place sand backfill/cap	4,356	ton	\$	45	\$ 196,000	Assume 2 ft and 4 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	9	day	\$ 6.0	00	\$ 55,600	Based on an assumed average removal rate and cap production rate of
Monitoring	4.544	,	<u> </u>		·	1,000 cy/day.
Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	1,541 481	ton				Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Direct Capital Cost Subtotal		СУ	Ψ	70	\$ 1,113,000	Assume a thickness of 6 mones.
Indirect Capital Cost		% of TDC	50%		\$ 557,000	
Total Capital Cost				•	\$ 1,670,000	
SMA-6					. ,. ,,.	
Sediment debris sweep and disposal	2.3	acre	\$ 30,0	00	\$ 69,000	
Removal of docks and large obstructions	0	Is	\$ 100,0	00	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	12,963	ton	\$	45	\$ 583,000	Assume 2 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	21	day	\$ 6,0	00	\$ 124,000	Based on an assumed average removal rate and cap production rate of
Monitoring Procure and place armor stone for exection protection			· ·			1,000 cy/day.
Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	5,926 1.852	ton		70 78	,	Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtotal	1	<i>∨</i> 7	Ψ	٠٥	\$ 1,335,000	produite a chienness of e filenes.
Indirect Capital Cost		% of TDC	50%		\$ 668,000	
Total Capital Cost		-			\$ 2,003,000	
SMA-7					,000,000	
Sediment debris sweep and disposal	1.95	acre	\$ 30,0	00	\$ 59,000	
Removal of docks and large obstructions	0	ls	\$ 100,0	00	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	17,241	ton	\$	45	\$ 776,000	Assume 4 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	17	day	\$ 6,0	00	\$ 103,000	Based on an assumed average removal rate and cap production rate of
Monitoring	0.540		*	70	A 470,000	1,000 cy/day.
Procure and place armor stone for erosion protection Direct Capital Cost Subtotal	2,519	ton	\$	70	\$ 176,000 \$ 1,114,000	Assume a thickness of 1 feet.
Indirect Capital Cost		% of TDC	50%		\$ 557,000	
Total Capital Cost		70 OI 1DO	3070	:	\$ 1,671,000	
SMA-8					3 1,011,000	
Sediment debris sweep and disposal	0.6	acre	\$ 30,0	00	\$ 18,000	
Removal of docks and large obstructions	0	ls	\$ 100,0	00	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	6,611	ton	\$	45	\$ 298,000	Assume 4 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	7	day	\$ 6,0	00	\$ 40,000	Based on an assumed average removal rate and cap production rate of
Monitoring	ļ <u> </u>	-	<u> </u>			1,000 cy/day.
Procure and place armor stone for erosion protection	756	ton	\$	70	· · · · · · · · · · · · · · · · · · ·	Assume a thickness of 6 inches.
Direct Capital Cost Subtotal Indirect Capital Cost		% of TDC	50%		\$ 409,000 \$ 204,500	
Total Capital Cost		70 01 TDC	30%	:	\$ 614,000	
SMA-9					3 014,000	
Sediment debris sweep and disposal	2.8	acre	\$ 30,0	00	\$ 85,000	
Removal of docks and large obstructions	1	Is	\$ 100,0	_	\$ 100,000	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	32,148	ton	\$	45	\$ 1,447,000	Assume 4 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	32	day	\$ 6,0	00	\$ 193,000	Based on an assumed average removal rate and cap production rate of
Monitoring		-				1,000 cy/day.
Procure and place armor stone for erosion protection	3,674	ton	\$	70		Assume a thickness of 1 foot.
Direct Capital Cost Subtotal		0/ of TDC	E00/		\$ 2,082,000 \$ 1.041.000	
Indirect Capital Cost		% of TDC	50%	:	, _,,,,,,,	
Total Capital Cost					\$ 3,123,000	
Sediment debris sweep and disposal	0.6	acre	\$ 30.0	00	\$ 17,000	
Removal of docks and large obstructions	1	Is	\$ 100,0	_		For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	69	су	\$	60		Diver assisted dredging around structures in the Marina
Dewatering of hydraulically dredged sediment	69	су		14	\$ 1,000	
Sediment removal by mechanical dredging (barge-mounted)	620	су			\$ 30,000	
Gravity dewatering on the barge	620	cy		10	\$ 6,000	
Barge transport to rail facility Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	947	ton	\$	5	\$ 5,000	
landfill	237	ton	\$ 2	01	\$ 48,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	710	ton	\$	69	\$ 49,000	
Procure and place sand backfill/cap	3,111	ton		_	\$ 140,000	Assume 2 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	4	day	\$ 6,0	00	\$ 23,000	Based on an assumed average removal rate and cap production rate of
Monitoring	74.4	-				1,000 cy/day.
Procure and place armor stone for erosion protection Direct Capital Cost Subtotal	711	ton	\$	70		Assume a thickness of 1 foot.
Direct Capital Cost Subtotal Indirect Capital Cost		% of TDC	50%		\$ 473,000 \$ 236,500	
Total Capital Cost		70 OI 1DO	JU/0		\$ 709,500	
SMA-11					7 109,500	
Sediment debris sweep and disposal	6.2	acre	\$ 30,0	00	\$ 185,000	
Removal of docks and large obstructions	0	Is	\$ 100,0	_	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	34,741	ton		_	\$ 1,563,000	Assume 2 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	52	day	\$ 6,0	00	\$ 310,000	Based on an assumed average removal rate and cap production rate of
Monitoring			· ·			1,000 cy/day.
Procure and place armor stone for erosion protection	11,911	ton		70 70		Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtotal	4,963	су	\$	78	\$ 387,000 \$ 3,279,000	Assume a thickness of 6 inches.
Indirect Capital Cost Subtotal		% of TDC	50%		\$ 3,279,000 \$ 1,640,000	
•		70 OI 1DO	50 70	:		
Total Capital Cost					\$ 4,919,000	



	Qua	antity	Cost		ost	
Description	Number	Unit	Unit Cost	-	Total Cost	Notes
SMA-12	•	•	•			•
Sediment debris sweep and disposal	7.2	acre	\$ 3	30,000	\$ 216,00	0
Removal of docks and large obstructions	0	Is		00,000		For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	59.759	ton	\$		\$ 2,689,00	
Procure and place 6-inch layer of pea gravel for armor	2,898	су	\$, , , , , , , , ,	O Assume thin gravel across 50% of SMA-12
Procure and place armor stone for erosion protection	4,637	ton	\$			O Assume 1-foot rock armor layer across 50% of SMA-12.
Construction Best Management Practices (BMPs) Maintenance and		1	†			Based on an assumed average removal rate and can production rate of
Monitoring	67	day	\$	6,000		1,000 cy/day.
Direct Capital Cost Subtotal	Direct Capital Cost Subtotal				\$ 3,712,00	0
Indirect Capital Cost		% of TDC	50%	_	\$ 1,856,00	0
Total Capital Cost	:			_	\$ 5,568,00	0
SMA-13						•
Sediment debris sweep and disposal	10.2	acre	\$ 3	30,000	\$ 306,00	0
Removal of docks and large obstructions	0	Is	\$ 10	00,000	\$	For removal of large obstructions from cap areas.
Procure and place enhanced natural recovery (ENR) layer	12,361	су	\$	44	\$ 544,00	O Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and		1	Ť.			Based on an assumed average removal rate and cap production rate of
Monitoring	12	day	\$	6,000		1,000 cy/day.
Direct Capital Cost Subtotal					\$ 924,00	0
Indirect Capital Cost	:	% of TDC	50%	_	\$ 462,00	0
Total Capital Cost	:			_	\$ 1,386,00	0
TOTAL CAPITAL COSTS (Direct and Indirect))				\$ 30,056,00	0
Operation & Maintenance Costs						
Upland Long-term Groundwater Monitoring						
Entire Upland Area - Groundwater Monitoring of shoreline wells q	uarterly for y	ear 0, annua	Ily for 10 yea	ars, follo	wed by four 5-ye	ar events
Groundwater sampling labor	30	well	T \$		\$ 15,0	00
Groundwater sample chemical analysis	30	well	\$	620	\$ 18,6	—Ouantity based on 30 shoreline wells including samples for field OA/OC.
Annual reporting	1	ls	1		\$ 100,0	
Direct Subtotal	_	1.0	1 + 20	,,,,,,	\$ 2,105,00	
Indirect O&M Costs		% of TDC	17%		\$ 358,0	
		_		-		
Undiscounted Subtotal (including Indirect Costs)				_	\$ 2,463,00	
Net Present Value Subtotal (including Indirect Costs)					\$ 2,533,00	0
Upland Cap Monitoring		1	1			
Cap monitoring, maintenance, and reporting - annual cost	1	ls	\$ 3	30,000	\$ 30,00	Assume annual monitoring for Years 1 to 10 followed by monitoring in Years 15, 20, 25 and 30.
Direct Subtotal		•	•		\$ 420,00	0
Indirect 0&M Costs	•	% of TDC	17.0%		\$ 71,40	0
Undiscounted Subtotal (including Indirect Costs)				=	\$ 491,00	
· -				_		
Net Present Value Subtotal (including Indirect Costs)					\$ 507,00	υ <u> </u>
Sediment - Capping, ENR, MNR and ICs	1	_	_	ı		
Sediment cap operation and maintenance monitoring and reporting	24	acre	\$ 2	20,000	\$ 480,00	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
ENR operation and maintenance monitoring and reporting	10	acre	\$ 1	2,500	\$ 125,00	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event		%		10%	\$ 1,719,70	O Assume repair in Year 5, and 10 after active remedy construction.
MNR operation and maintenance monitoring and reporting	23	acre	\$ 1	0,000	\$ 230,00	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active
Institutional Controls - annual cost	1	Is		25,000		remedy construction.
Direct Subtotal	<u></u>	1.3	1 +		\$ 10,869,40	
		% of TDC	17%			
Indirect O&M Costs Undiscounted Subtotal (including Indirect Costs)		% of TDC	1 1 70	=	\$ 1,847,79 \$ 12,717,00	
Net Present Value Subtotal (including Indirect Costs))				\$ 13,181,00	
Total Undiscounted 0&M Costs (30 Years)					\$ 15,671,00	L
Total Net Present Value of O&M Costs (30 Years)					\$ 16,221,00	
Contingency (30 Percent of Total Cost)					\$ 13,883,00	
Contingency (oo i cicent of fotal cost)	1				+ 10,000,00	<u>, </u>
Total Cost of Alternative (Present Worth)					\$ 60,160,00	0

Notes:

Present worth calculated using equal series present worth analysis where i = -0.3%



Table 13B-4

Alternative 2
Gas Works Park Site
Seattle, Washington

	Qua	antity		Cost	
Description	Number	Unit	Unit Cost	Total Cost	Notes
Capital Costs (Direct and Indirect)					
GWMA-1, SMA-1 and SMA-2					
Upland earthwork temporary controls (erosion control, temporary facilities,					
access controls)	1	ls	\$ 100,000	\$ 100,000	Assumed to apply to all upland work.
Air and Dust Monitoring	60	day	\$ 500	\$ 30,000	Assume perimeter and work area dust monitoring using hand-held real-time dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	ls	\$ 150,000	\$ 150,000	
Stormwater collection, water collection from material stockpile areas (from dewatering), treatment, and discharge system during construction	1	ls	\$ 100,000	\$ 100,000	Costs include mobilization, setup, rental, demobilization, treatment and discharge.
Clear and Grub trees up to 12" diameter	1	acre	\$ 13,546	\$ 14,000	
Soil Excavation (upto 15 feet)	2,452	су	\$ 14	\$ 34,000	Cost includes screening and handling of oversized debris encountered durin excavation.
Dewatering System - Shallow Excavation	1	Is	\$ 50,000	\$ 50,000	Assumed to apply to tar mound excavation work. Includes water collection and off-site management.
On-site stockpiling and management of excavated material	2,452	су	\$ 5	\$ 12,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	2,832	ton	\$ 201	\$ 569,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Transport (truck), incinerate and dispose soil at hazardous waste facility in (Aragonite, Utah)	944	ton	\$ 1,008	\$ 952,000	Assume 25% soil from tar mound excavation is classified as hazardous and requires incineration. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Rough grade for cap surface preparation	1	ls	\$ 3,240	\$ 3,000	Cap area to be rough graded is less than 1 acre.
Procure and Install Geotextile	3,582	sy	\$ 2.98	\$ 11,000	
Cap drainage layer - import, place, compact	657	су	\$ 63	\$ 41,000	Assume 6 inch thick layer of drainage rock (i.e, Type 17).
Procure and Place Topsoil	1,970	су	\$ 56		Assume 1.5 ft thick layer of topsoil.
Hydroseeding	3,582	sy	\$ 3	\$ 11,000	
Post-construction upland survey	1	each	\$ 3,571		Final as-built survey for upland construction.
Shoreline Restoration	1	ls	\$ 100,000	\$ 100,000	
Mobilization and Demobilization	4	each	\$ 13,155	\$ 53,000	In-Situ Chemical Fixation (ISCF) mob and demob.
ISCF Reagent Application	1	ls	\$ 300,000	\$ 300,000	Includes labor, equipment, injection point drilling and reagent costs. Assum 4 events.
Process Monitoring	1	ls	\$ 120,000	\$ 120,000	ISCF process monitoring, new wells, sample collection and analysis.
Institutional Controls/Restrictive Covenants Preparation	1	ls	\$ 75,000	·	Assumed cost for initial setup of institutional controls for uplands and inwater work.
Direct Capital Cost Subtota				\$ 2,839,000	
Indirect Capital Cos		% of TDC	50%	\$ 1,420,000	
Total Capital Cos				\$ 4,259,000	
SMA-3	1				<u></u>
Sediment debris sweep and disposal	1.0	acre	\$ 30,000		
Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area	1	ls Is	\$ 100,000 \$ 325,000	\$ - \$ 163,000	For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4
	4.000	-			·
Sediment excavation using land-based excavation equipment	4,889 4,889	су	\$ 49	\$ 240,000	
Handling and dewatering of sediment from land-based excavation	4,000	су	\$ 15	\$ 73,000	
		cy		,	
Handling of water drained from excavated sediment	10	cy	\$ 15 \$ 10,000	\$ 73,000 \$ 100,000	
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	10	day	\$ 10,000 \$ 201	\$ 100,000 \$ 338,000	
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill	10 1,681 5,042	day ton ton	\$ 10,000 \$ 201 \$ 69	\$ 100,000 \$ 338,000 \$ 348,000	Accume 2 ft and 4 ft thick can
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	10	day	\$ 10,000 \$ 201	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000	Assume 2 ft and 4 ft thick cap. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap	10 1,681 5,042 3,831	ton ton	\$ 10,000 \$ 201 \$ 69 \$ 45	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay	10 1,681 5,042 3,831 15,600 28,300	day ton ton ton sf	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26 \$ 26	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Assume application of 5% ZVI.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay Purchase and Install Reactive Core MatTM Granular Activated Carbon	10 1,681 5,042 3,831 15,600	day ton ton ton sf	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay Purchase and Install Reactive Core MatTM Granular Activated Carbon Amended cap media: Zero-Valent Iron	10 1,681 5,042 3,831 15,600 28,300	day ton ton ton sf	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26 \$ 26	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000 \$ 1,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Assume application of 5% ZVI. Mixing sand with 5% ZVI.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay Purchase and Install Reactive Core MatTM Granular Activated Carbon Amended cap media: Zero-Valent Iron Prepare amended cap blend	10 1,681 5,042 3,831 15,600 28,300 24,889 178 178	day ton ton sf sf lb cy	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26 \$ 26 \$ 3 \$ 7 \$ 51 \$ 6,000	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000 \$ 1,000 \$ 9,000 \$ 73,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Assume application of 5% ZVI. Mixing sand with 5% ZVI.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay Purchase and Install Reactive Core MatTM Granular Activated Carbon Amended cap media: Zero-Valent Iron Prepare amended cap blend Amended Cap placement Construction Best Management Practices (BMPs) Maintenance and	10 1,681 5,042 3,831 15,600 28,300 24,889 178	day ton ton ton sf sf lb cy cy	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26 \$ 26 \$ 3 \$ 7 \$ 51 \$ 6,000	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000 \$ 1,000 \$ 9,000 \$ 73,000 \$ 181,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Assume application of 5% ZVI. Mixing sand with 5% ZVI. Placement of sand blended with 5% ZVI. Assume 12-inch thick amended call Based on an assumed average removal rate and cap production rate of
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay Purchase and Install Reactive Core MatTM Granular Activated Carbon Amended cap media: Zero-Valent Iron Prepare amended cap blend Amended Cap placement Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	10 1,681 5,042 3,831 15,600 28,300 24,889 178 178 12 2,590 809	day ton ton sf sf lib cy cy day	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26 \$ 26 \$ 3 \$ 7 \$ 51	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000 \$ 75,000 \$ 1,000 \$ 9,000 \$ 73,000 \$ 63,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Assume application of 5% ZVI. Mixing sand with 5% ZVI. Placement of sand blended with 5% ZVI. Assume 12-inch thick amended ca Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay Purchase and Install Reactive Core MatTM Granular Activated Carbon Amended cap media: Zero-Valent Iron Prepare amended cap blend Amended Cap placement Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtota	10 1,681 5,042 3,831 15,600 28,300 24,889 178 178 12 2,590 809	day ton ton ton sf sf lb cy cy day ton cy	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26 \$ 26 \$ 3 \$ 7 \$ 51 \$ 6,000 \$ 70 \$ 78	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000 \$ 1,000 \$ 9,000 \$ 73,000 \$ 181,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Assume application of 5% ZVI. Mixing sand with 5% ZVI. Placement of sand blended with 5% ZVI. Assume 12-inch thick amended ca Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Assume a thickness of 2 feet.
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Purchase and Install Reactive Core MatTM Organoclay Purchase and Install Reactive Core MatTM Granular Activated Carbon Amended cap media: Zero-Valent Iron Prepare amended cap blend Amended Cap placement Construction Best Management Practices (BMPs) Maintenance and Monitoring Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	10 1,681 5,042 3,831 15,600 28,300 24,889 178 178 12 2,590 809	day ton ton ton sf sf lb cy cy day ton	\$ 10,000 \$ 201 \$ 69 \$ 45 \$ 26 \$ 26 \$ 3 \$ 7 \$ 51 \$ 6,000	\$ 100,000 \$ 338,000 \$ 348,000 \$ 172,000 \$ 406,000 \$ 736,000 \$ 75,000 \$ 1,000 \$ 9,000 \$ 73,000 \$ 63,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume it sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume if t sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day. Assume application of 5% ZVI. Mixing sand with 5% ZVI. Placement of sand blended with 5% ZVI. Assume 12-inch thick amended ca Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Assume a thickness of 2 feet.



	Λus	ntity	Cost				
Description	Number	Unit	Unit Cos		Total Co	et	Notes
Description SMA-4	Humber	Ollic	Onic Oos	, ,	Total oo	31	Notes
Sediment debris sweep and disposal	0.3	acre	\$	30,000	\$	8,000	
Removal of docks and large obstructions	0.0	Is	\$	100,000	\$	-	For removal of large obstructions from cap areas.
				,			
Shoring and/or coffer dam install for excavation in lakeshore area	1	ls	\$	325,000	\$	163,000	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	1,378	су	\$	49	\$	68,000	
Handling and dewatering of sediment from land-based excavation	1,378	су	\$	15	\$	21,000	
Handling and dewatering of Sediment from land-based excavation	1,576	СУ	, i		Ψ.	21,000	
Handling of water drained from excavated sediment	10	day	\$	10,000	\$	100,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	474	ton	\$	201	\$	95,000	
landfill Transport (truck/train) and dispose soil to Subtitle D landfill	1,421	ton	\$	69	\$	98,000	
Procure and place sand backfill/cap	972	ton	\$	45	\$		Assume 2 ft and 4 ft thick cap.
Purchase and Install Reactive Core MatTM Organoclay	4,000	sf	\$	26	\$	·	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm (2 cm AC and OC). Assume 1 ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
Purchase and Install Reactive Core MatTM Granular Activated Carbon	9,000	sf	\$	26	\$	234,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm (2 cm AC and OC). Assume 1 ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
Construction Best Management Practices (BMPs) Maintenance and	3	day	\$	6,000	\$	20,000	Based on an assumed average removal rate and cap production rate of
Monitoring		<u> </u>	· ·	·			1,000 cy/day.
Procure and place armor stone for erosion protection	711	ton	\$				Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	222	су	\$	78			Assume a thickness of 6 inches.
Direct Capital Cost Subtotal		% of TDO	50%		\$	1,022,000	
Indirect Capital Cost		% of TDC	50%	;	\$	511,000	
Total Capital Cost					\$ 2	1,533,000	
SMA-5 Sodiment debris sweep and disposal	0.6	2070	¢	20.000	¢	10.000	
Sediment debris sweep and disposal Removal of docks and large obstructions	0.6	acre Is	\$	30,000	\$	18,000 100,000	For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	289		\$	60	\$		-
Dewatering of hydraulically dredged sediment	289	cy cy	\$	14	\$	4,000	Diver assisted dredging around shoreline structures
Sediment removal by mechanical dredging (barge-mounted)	2,600	су	\$	48	\$	125,000	
Gravity dewatering on the barge	2,600	су	\$	10	\$	26,000	
Barge transport to rail facility	3,972	ton	\$	5	\$	20,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	993	ton	\$	201	\$	200,000	
landfill	993	ton	Ф	201	Ф	200,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$	69	\$	206,000	
Procure and place sand backfill/cap	1,685	ton	\$	45	\$	76,000	Assume 2 ft thick cap.
Purchase and Install Reactive Core MatTM Organoclay	4,000	sf	\$	26	\$	104,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm (2 cm AC and OC). Assume 1 ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
Purchase and Install Reactive Core MatTM Granular Activated Carbon	26,000	sf	\$	26	\$	676,000	Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm (2 cm AC and OC). Assume 1 ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
Procure and place armor stone for erosion protection	1,541	ton	\$	70	\$	108,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	481	су	\$	78	\$	38,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	7	day	\$	6,000	\$	40,000	Based on an assumed average removal rate and cap production rate of
Monitoring				·		4 === 0 000	1,000 cy/day.
Direct Capital Cost Subtotal		o/ (TD0	=00/		\$	1,758,000	
Indirect Capital Cost		% of TDC	50%	;	\$	879,000	
Total Capital Cost					\$ 2	2,637,000	
SMA-6	0.0	1	Ι φ	20.000	Δ.	00.000	
Sediment debris sweep and disposal	2.3	acre	\$	30,000	\$	69,000	For removal of large chatriotisms from our areas
Removal of docks and large obstructions	12.963	ls ton	\$,	\$		For removal of large obstructions from cap areas.
Procure and place sand backfill/cap Construction Best Management Practices (BMPs) Maintenance and	,	ton	1	45			Assume 2 ft thick cap. Based on an assumed average removal rate and cap production rate of
Monitoring	21	day	\$	6,000	\$	124,000	1,000 cy/day.
Procure and place armor stone for erosion protection	5,926	ton	\$	70	\$	415,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	1,852	су	\$	78			Assume a thickness of 6 inches.
Direct Capital Cost Subtotal			•		\$	1,335,000	
Indirect Capital Cost		% of TDC	50%		\$	667,500	
Total Capital Cost				•	\$ 2	2,002,500	
SMA-7						. ,	
Sediment debris sweep and disposal	1.95	acre	\$	30,000	\$	59,000	
Removal of docks and large obstructions	0	Is	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	17,241	ton	\$	45	\$	776 000	Assume 2 ft thick cap overall, with 4 ft thick cap in shallow NAPL areas.
			, i				
Procure and place armor stone for erosion protection	2,519	ton	\$	70	\$	176,000	Assume a thickness of 1 feet.
Construction Best Management Practices (BMPs) Maintenance and	17	day	\$	6,000	\$	103,000	Based on an assumed average removal rate and cap production rate of
Monitoring Divact Conital Cost Subtotal		<u>I</u>				,	1,000 cy/day.
Direct Capital Cost Subtotal		% of TDC	50%		\$	1,114,000	
Indirect Capital Cost		% of TDC	50%	:	φ •	557,000	
Total Capital Cost					\$ 1	1,671,000	
SMA-8 Sadiment debris sween and disposal	0.6	acro	\$	30,000	\$	18,000	
Sediment debris sweep and disposal Removal of docks and large obstructions	0.6	acre Is	\$,			For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	6,611	ton	\$	45			Assume 4 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	J, V ± ±						Based on an assumed average removal rate and cap production rate of
Monitoring	7	day	\$	6,000	\$	40,000	1,000 cy/day.
Procure and place armor stone for erosion protection	756	ton	\$	70	\$	53,000	Assume a thickness of 1 foot
Direct Capital Cost Subtotal		•	-		\$	409,000	
Indirect Capital Cost		% of TDC	50%		\$	204,500	
Total Capital Cost				;	\$	613,500	
					•	- ,- 3 •	



		antity			ost	\dashv
escription	Number	Unit	Unit Co	ost	Total Cost	Notes
SMA-9						
Sediment debris sweep and disposal	2.8	acre	\$	30,000	\$ 85,	000
Removal of docks and large obstructions	1	ls	\$	100,000	\$ 100,	OOO For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	32,148	ton	\$	45		OOO Assume 4 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and	,		+		. , ,	Based on an assumed average removal rate and cap production rate o
Monitoring	32	day	\$	6,000	\$ 193,	1,000 cy/day.
Procure and place armor stone for erosion protection	3,674	ton	\$	70	\$ 257.	
		ton	Ψ	10		
Direct Capital Cost Subtot					-,,	
Indirect Capital Co	st	% of TDC	50%		\$ 1,041,0	000
Total Capital Co	st				\$ 3,123,0	00
SMA-10						
Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$ 17,	000
Removal of docks and large obstructions	1	ls	\$	100,000	\$ 100.	OOO For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	69	су	\$	60		Diver assisted dredging around structures in the Marina
Dewatering of hydraulically dredged sediment	69	су	\$	14	,	000
	620		\$	48	\$ 30,	
Sediment removal by mechanical dredging (barge-mounted)		су				
Gravity dewatering on the barge	620	#REF!	\$	10	,	000
Barge transport to rail facility	947	ton	\$	5	\$ 5,	000
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	237	ton	\$	201	\$ 48,	000
landfill					40,	
Transport (truck/train) and dispose soil to Subtitle D landfill	710	ton	\$	69	\$ 49,	000
Procure and place sand backfill/cap	3,111	ton	\$	45	\$ 140,	OOO Assume 2 ft thick cap.
Construction Best Management Practices (BMPs) Maintenance and						Based on an assumed average removal rate and cap production rate o
Monitoring	4	day	\$	6,000	\$ 23,	1,000 cy/day.
Procure and place armor stone for erosion protection	711	ton	\$	70	\$ 50.	
		ton	Ψ	10	· · · · · · · · · · · · · · · · · · ·	
Direct Capital Cost Subtot					\$ 473,	
Indirect Capital Co	st	% of TDC	50%		\$ 236,	500
Total Capital Co	st				\$ 709,5	00
SMA-11						
Sediment debris sweep and disposal	6.2	acre	\$	30,000	\$ 185.	000
Removal of docks and large obstructions	0	ls	\$	100,000	\$	- For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	34,741	ton	\$	45	\$ 1,563,0	
Construction Best Management Practices (BMPs) Maintenance and	0 1,1 12	ton	+	10	Ψ 1,000,	
	52	day	\$	6,000	\$ 310,	Based on an assumed average removal rate and cap production rate o 1,000 cy/day.
Monitoring	11.011			70	A 00.4	* *
Description and also a superior and		ton	\$	70		Assume a thickness of 2 feet.
Procure and place armor stone for erosion protection	11,911		4			
Procure and place fish mix on armor rock to fill interstitial voids	4,963	су	\$	78		Assume a thickness of 6 inches.
	4,963	су	\$	78	\$ 387, \$ 3,279,0	
Procure and place fish mix on armor rock to fill interstitial voids	4,963	cy % of TDC	50%	78		000
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co	4,963	1.		78	\$ 3,279,0 \$ 1,639,5	500
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co	4,963	1.		78	\$ 3,279,0	500
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co	4,963 cal sst	% of TDC	50%		\$ 3,279,\\ \$ 1,639,\\ \$ 4,918,5	000 000 000
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal	4,963 cal sst sst 7.2	% of TDC	50%	30,000	\$ 3,279,0 \$ 1,639,0 \$ 4,918,5 \$ 216,	000 000
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions	4,963 cal sst sst 7.2 0	% of TDC	50%	30,000 100,000	\$ 3,279,0 \$ 1,639,0 \$ 4,918,5 \$ 216,	000 000 - For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal	4,963 cal sst sst 7.2	% of TDC	\$ \$ \$	30,000 100,000 45	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0	000 - For removal of large obstructions from cap areas. 000 Assume 4 ft thick cap.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions	4,963 cal sst sst 7.2 0	% of TDC	50%	30,000 100,000	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0	000 000 - For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap	4,963 sal sst sst 7.2 0 59,759	% of TDC acre Is ton	\$ \$ \$	30,000 100,000 45	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 78,0	000 - For removal of large obstructions from cap areas. 000 Assume 4 ft thick cap.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor	7.2 0 59,759 2,898 4,637	% of TDC acre Is ton cy ton	\$ \$ \$ \$ \$	30,000 100,000 45 27 70	\$ 3,279,0 \$ 1,639,0 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 78,0 \$ 325,	000 - For removal of large obstructions from cap areas. 000 Assume 4 ft thick cap. 000 Assume thin gravel over 50% of SMA-12 000 Assume 1-foot rock armor layer across 50% of SMA-12. 000 Based on an assumed average removal rate and cap production rate of
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection	4,963 al set 7.2 0 59,759 2,898	% of TDC acre Is ton cy	50% \$ \$ \$	30,000 100,000 45 27	\$ 3,279,0 \$ 1,639,0 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 78,0 \$ 325,	000 - For removal of large obstructions from cap areas. 000 Assume 4 ft thick cap. 000 Assume thin gravel over 50% of SMA-12 000 Assume 1-foot rock armor layer across 50% of SMA-12. 000 Based on an assumed average removal rate and cap production rate of
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring	7.2 0 59,759 2,898 4,637 60	% of TDC acre Is ton cy ton	\$ \$ \$ \$ \$	30,000 100,000 45 27 70	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 78,0 \$ 325, \$ 359,	000 For removal of large obstructions from cap areas. Assume 4 ft thick cap. Assume thin gravel over 50% of SMA-12 Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtot	7.2 0 59,759 2,898 4,637 60	% of TDC acre Is ton cy ton day	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45 27 70	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 325, \$ 359,	000 For removal of large obstructions from cap areas. Assume 4 ft thick cap. Assume thin gravel over 50% of SMA-12 Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtot Indirect Capital Co	7.2 0 59,759 2,898 4,637 60	% of TDC acre Is ton cy ton	\$ \$ \$ \$ \$	30,000 100,000 45 27 70	\$ 3,279,0 \$ 1,639,0 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 325, \$ 359, \$ 3,667,0 \$ 1,833,0	000 - For removal of large obstructions from cap areas. 000 Assume 4 ft thick cap. 000 Assume thin gravel over 50% of SMA-12 000 Assume 1-foot rock armor layer across 50% of SMA-12. 000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtot Indirect Capital Co	7.2 0 59,759 2,898 4,637 60	% of TDC acre Is ton cy ton day	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45 27 70	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 325, \$ 359,	000 - For removal of large obstructions from cap areas. 000 Assume 4 ft thick cap. 000 Assume thin gravel over 50% of SMA-12 000 Assume 1-foot rock armor layer across 50% of SMA-12. 000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
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Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Cost Subtot Indirect Capital Cost SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtot Indirect Capital Cost SMA-13	4,963 (a) (b) (c) (c) (d) (d) (e) (e) (e) (e) (e) (e	% of TDC acre Is ton cy ton day % of TDC	50% \$ \$ \$ \$ \$	30,000 100,000 45 27 70 6,000	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 78,1 \$ 325, \$ 359, \$ 3,667,0 \$ 1,833,0 \$ 5,500,5	000 For removal of large obstructions from cap areas. 000 Assume 4 ft thick cap. 000 Assume thin gravel over 50% of SMA-12 000 Assume 1-foot rock armor layer across 50% of SMA-12. 000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtot Indirect Capital Cost Subtot SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions	4,963	% of TDC acre Is ton cy ton day % of TDC	50% \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45 27 70 6,000 30,000	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 78,0 \$ 325, \$ 359,0 \$ 1,833,1 \$ 5,500,5 \$ 306,	000 For removal of large obstructions from cap areas. Assume 4 ft thick cap. Assume thin gravel over 50% of SMA-12 Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. 000 000 For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Direct Capital Cost Subtot Indirect Capital Co Total Capital Co SMA-12 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtot Indirect Capital Cost Subtot SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place enhanced natural recovery (ENR) layer	7.2 0 59,759 2,898 4,637 60	% of TDC acre Is ton cy ton day % of TDC	50% \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45 27 70 6,000	\$ 3,279,0 \$ 1,639,1 \$ 4,918,5 \$ 216, \$ 2,689,0 \$ 78,0 \$ 325, \$ 359,0 \$ 1,833,1 \$ 5,500,5 \$ 306,	000 For removal of large obstructions from cap areas. Assume 4 ft thick cap. Assume thin gravel over 50% of SMA-12 Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. COO For removal of large obstructions from cap areas. Assume a thickness of 6 inches.
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	Qu	ıantity		C	ost		
Description	Number	Unit	Unit Cost	t	Tota	al Cost	Notes
Operation & Maintenance Costs							
Upland Long-term Groundwater Monitoring							
Entire Upland Area - Groundwater Monitoring of shoreline wells q	uarterly for	year 0, annua	ally for 10 y	years, foll	owe	d by four 5-year	events
Groundwater sampling labor	30	well	\$	500	\$	15,000	Quantity based on 30 shoreline wells including samples for field QA/QC.
Groundwater sample chemical analysis	30	well	\$	620	\$	18,600	quantity sussed on see shoroline wolle moldaling sumples for held Qiy Qo.
Annual reporting	1	Is	\$	100,000	\$	100,000	
Direct Subtotal	l				\$	2,104,800	
Indirect 0&M Costs	3	% of TDC	17%	,	\$	357,816	
Undiscounted Subtotal (including Indirect Costs))				\$	2,463,000	
Net Present Value Subtotal (including Indirect Costs))				\$	2,533,000	
Upland Cap Monitoring							
Cap monitoring, maintenance, and reporting - annual cost	1	ls	\$	30,000	\$	30,000	Assume annual monitoring for Years 1 to 10 followed by monitoring in Year 15, 20, 25 and 30.
Direct Subtotal					\$	420,000	
Indirect 0&M Costs	3	% of TDC	17.0%		\$	71,400	
Undiscounted Subtotal (including Indirect Costs))	;	\$	491,400			
Net Present Value Subtotal (including Indirect Costs))				\$	507,000	
Sediment - Capping, ENR, MNR and ICs							
Sediment cap operation and maintenance monitoring and reporting	24	acre	\$	20,000	\$	480,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
ENR operation and maintenance monitoring and reporting	10	acre	\$	12,500	\$	125,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event		%		10%	\$	1,907,100	Assume repair in Year 5, and 10 after active remedy construction.
MNR operation and maintenance monitoring and reporting	23	acre	\$	10,000	\$	230,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Institutional Controls - annual cost	1	ls	\$	25,000	\$	25,000	Assume annual costs for 30 years.
Direct Subtotal]				\$	11,244,200	
Indirect 0&M Costs	3	% of TDC	17%		\$	1,911,514	
Undiscounted Subtotal (including Indirect Costs))			<u>!</u>	\$	13,155,714	
Net Present Value Subtotal (including Indirect Costs))				\$	13,630,000	
Total Undiscounted O&M Costs (30 Years)					\$	16,110,000	
Total Net Present Value of O&M Costs (30 Years)					\$	16,670,000	
Contingency (30 Percent of Total Cost)					\$	14,861,000	
Total Cost of Alternative (Present Worth))				Ś	64,400,000	



Alternative 3 Gas Works Park Site Seattle, Washington

		ntity		Cost	
Description	Number	Unit	Unit Cost	Total Cost	Notes
Capital Costs (Direct and Indirect) GWMA-1, SMA-1 and SMA-2					
Upland earthwork temporary controls (erosion control, temporary facilities, access controls)	1	Is	\$ 100,000	\$ 100,000	Assumed to apply to all upland work.
Air and Dust Monitoring	60	day	\$ 500	\$ 30,000	Assume perimeter and work area dust monitoring using hand-held real-time dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	ls	\$ 150,000	\$ 150,000	
Stormwater collection, water collection from material stockpile areas (from	1	Is	\$ 100,000	\$ 100,000	Costs include mobilization, setup, rental, demobilization, treatment and discharge.
dewatering), treatment, and discharge system during construction Clear and Grub trees up to 12" diameter	1	acre	\$ 13,546	\$ 14,000	uistriaige.
Soil Excavation (upto 15 feet)	2,452	су	\$ 14		Cost includes screening and handling of oversized debris encountered during excavation.
Dewatering System - Shallow Excavation	1	Is	\$ 50,000	\$ 50,000	Assumed to apply to tar mound excavation work. Includes water collection and off-site management.
On-site stockpiling and management of excavated material	2,452	су	\$ 5	\$ 12,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	2,832	ton	\$ 201	\$ 569,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Transport (truck), incinerate and dispose soil at hazardous waste facility in (Aragonite, Utah)	944	ton	\$ 1,008	\$ 952,000	Assume 25% soil from tar mound excavation is classified as hazardous and requires incineration. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Rough grade for cap surface preparation Procure and Install Geotextile	1 3,582	ls sv	\$ 3,240 \$ 2.98	· ·	Cap area to be rough graded is less than 1 acre.
Cap drainage layer - import, place, compact	657	cy	\$ 63	,	Assume 6 inch thick layer of drainage rock (i.e, Type 17).
Procure and Place Topsoil	1,970	су	\$ 56	· ·	Assume 1.5 ft thick layer of topsoil.
Hydroseeding Post-construction upland survey	3,582 1	sy each	\$ 3.571	\$ 11,000 \$ 4,000	Final as-built survey for upland construction.
Shoreline Restoration	1	ls eacn	\$ 3,571	,	r mar as sum survey for upiana construction.
Mobilization and Demobilization	4	each	\$ 13,155		In-Situ Chemical Fixation (ISCF) mob and demob.
ISCF Reagent Application	1	ls	\$ 300,000	\$ 300,000	Includes labor, equipment, injection point drilling and reagent costs. Assume 4 events.
Process Monitoring	1	Is	\$ 120,000	\$ 120,000	ISCF process monitoring, new wells, sample collection and analysis.
Institutional Controls/Restrictive Covenants Preparation	1	Is	\$ 75,000	\$ 75,000	Assumed cost for initial setup of institutional controls for uplands and inwater work.
Direct Capital Cost Subtotal				\$ 2,839,000	water work.
Indirect Capital Cost		% of TDC	50%		
Total Capital Cost				\$ 4,258,500	
Sediment debris sweep and disposal	1.0	acre	\$ 30,000		
Removal of docks and large obstructions	0	ls	\$ 100,000	\$ -	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment	1 4,889	ls cy	\$ 325,000 \$ 49	·	Assume costs are split between SMA-3 and SMA-4
Handling and dewatering of sediment from land-based excavation	4.889	су	\$ 15	,	
	,	day	\$ 10,000	·	
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)		-			
landfill	1,681	ton	\$ 201	·	
Transport (truck/train) and dispose soil to Subtitle D landfill	5,042	ton	\$ 69	\$ 348,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
Procure and place sand backfill/cap	3,831	ton	\$ 45	\$ 172,000	cap.
Procure and Install Geotextile	28,300	sy	\$ 2.98	\$ 84,000	
Procure and place Impermeable Liner	28,300	sf	\$ 2.00	\$ 57,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with
Procure and place geocomposite gas collection layer	600	lf	\$ 6.00	\$ 4,000	a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	2,590	ton	\$ 70		Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and	809	су	\$ 78	,	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Monitoring	12	day	\$ 6,000	\$ 73,000	1,000 cy/day.
Direct Capital Cost Subtotal Indirect Capital Cost		% of TDC	50%	\$ 1,926,000 \$ 963,000	
Total Capital Cost		76 OI TDC	30%	\$ 2,889,000	
SMA-4				•	
Sediment debris sweep and disposal Removal of docks and large obstructions	0.3	acre Is	\$ 30,000 \$ 100,000	,	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$ 325,000		Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	1,378	су	\$ 49	\$ 68,000	
Handling and dewatering of sediment from land-based excavation	1,378	су	\$ 15	\$ 21,000	
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)		day	\$ 10,000	·	
landfill	474	ton	\$ 201	·	
Transport (truck/train) and dispose soil to Subtitle D landfill	1,421	ton	\$ 69	\$ 98,000	Assume 2 ft thick can Includes could hadding (6 inches) for law permachility
Procure and place sand backfill/cap	972	ton	\$ 45	\$ 44,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap.
Procure and Install Geotextile	9,000	sy	\$ 2.98	\$ 27,000	
Procure and place Impermeable Liner	9,000	sf	\$ 2.00	\$ 18,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item.
Procure and place geocomposite gas collection layer	200	lf	\$ 6.00	·	Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	711	ton	\$ 70		Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and	222	су	\$ 78		Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Monitoring	3	day	\$ 6,000		1,000 cy/day.
Direct Capital Cost Subtotal		0/ 64750	E00/	\$ 730,000 \$ 365,000	
Indirect Capital Cost		% of TDC	50%	\$ 365,000	I
Total Capital Cost			3070	\$ 1,095,000	



		antity	1		Cost	1
Description	Number	Unit	Unit Cos	t	Total Cost	Notes
SMA-5	0.0	1.	1	00.5		
Sediment debris sweep and disposal	0.6	acre	\$	30,000	,	
Removal of docks and large obstructions	289	ls	\$	100,000		For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head) Dewatering of hydraulically dredged sediment	289	cy cy	\$	14		Diver assisted dredging around shoreline structures
Sediment removal by mechanical dredging (barge-mounted)	2,600	су	\$	48	,	
Gravity dewatering on the barge	2,600	су	\$	10		
Barge transport to rail facility	3,972	ton	\$	5		
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	000		Α	004		
landfill	993	ton	\$	201	\$ 200,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$	69	\$ 206,000	
Procure and place sand backfill/cap	1,685	ton	\$	45	\$ 76,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
<u> </u>	,				,	сар.
Procure and Install Geotextile	26,000	sy	\$	2.98	\$ 78,000	
Procure and place Impermeable Liner	26,000	sf	\$	2.00	\$ 52,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
						included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with
Procure and place geocomposite gas collection layer	600	If	\$	6.00	\$ 4,000	a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	1,541	ton	\$	70	\$ 108,000	· · ·
Procure and place fish mix on armor rock to fill interstitial voids	481	су	\$	78		
Construction Best Management Practices (BMPs) Maintenance and			1.		4 40.000	Based on an assumed average removal rate and cap production rate of
Monitoring	1	day	\$	6,000	\$ 40,000	1,000 cy/day.
Direct Capital Cost Subtot	al		•		\$ 1,112,000	
Indirect Capital Co	st	% of TDC	50%		\$ 556,000	
Total Capital Co	st				\$ 1,668,000	
SMA-6						
Sediment debris sweep and disposal	2.3	acre	\$	30,000		
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	12,963	ton	\$	45	\$ 583,000	Assume 2 ft thick cap
Construction Best Management Practices (BMPs) Maintenance and	21	day	\$	6,000	\$ 124,000	Based on an assumed average removal rate and cap production rate of
Monitoring	F 000	,	Α.	7.0	445.000	1,000 cy/day.
Procure and place armor stone for erosion protection	5,926	ton	\$ \$	70		Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	1,852	су	\$	78		Assume a thickness of 6 inches.
Direct Capital Cost Subtot		% of TDC	E09/		, , , , , , , , , , , , , , , , , , , ,	
Indirect Capital Co		% of TDC	50%		\$ 667,500	
Total Capital Co	st				\$ 2,002,500	
SMA-7	I	1	_		I	
Sediment debris sweep and disposal	2.0	acre	\$	30,000		
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	11,019	ton	\$	45	\$ 496,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area.
			+			
Purchase and place AquagateTM with Powdered Activated Carbon	20,000	sf	\$	10	\$ 200,000	Placement of 4-inch layer of AC cap material (Aquagate-AC)
Purchase and place AquagateTM with Organoclay	46,800	sf	\$	25	\$ 1,170,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Amended cap media: Zero-Valent Iron	248,889	lb	\$			Assume application of 5% ZVI.
Prepare amended cap blend	1,778	су	\$	7	\$ 12,000	Mixing sand with 5% ZVI.
Amandad Can placement	1 770		\$	E1	¢ 01.000	Placement of sand blended with 5% ZVI. Assume 12-inch thick amended car
Amended Cap placement	1,778	су	\$	51	\$ 91,000	Placement of sand blended with 5% ZVI. Assume 12-Inch thick amended cap
Procure and place armor stone for erosion protection	2,519	ton	\$	70	\$ 176,000	Assume a thickness of 1 feet.
Construction Best Management Practices (BMPs) Maintenance and	15	day	\$	6,000	\$ 92,000	Based on an assumed average removal rate and cap production rate of
Monitoring	10	uuy	<u> </u>	0,000	\$ 52,000	1,000 cy/day.
Direct Capital Cost Subtot					\$ 3,043,000	
Indirect Capital Co	st	% of TDC	50%		\$ 1,521,500	
Total Capital Co	st				\$ 4,564,500	
SMA-8						
Sediment debris sweep and disposal	0.6	acre	\$	30,000		
Removal of docks and large obstructions	0	Is	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	3,306	ton	\$	45	\$ 149,000	Includes $f 1$ ft of sand bedding and $f 1$ ft sand cover for the amended cap area.
	25 500	cf	\$			
Purchase and place AquagateTM with Organoclay	25,500 756	sf	\$	25 70		Placement of 4-inch layer of OC cap material (Aquagate-OC) Assume a thickness of 1 foot
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and	100	ton	φ	70	φ 53,000	Assume a thickness of 1 foot Based on an assumed average removal rate and cap production rate of
Monitoring	4	day	\$	6,000	\$ 24,000	1,000 cy/day.
Direct Capital Cost Subtot	L al	<u>l</u>			\$ 882,000	
Indirect Capital Co		% of TDC	50%		\$ 441,000	
Total Capital Co		,, or 100	5070		\$ 1,323,000	1
SMA-9	,				¥ 1,323,000	l
Sediment debris sweep and disposal	2.8	acre	\$	30.000	\$ 85.000	<u> </u>
Samon domo ovecp and disposal	0	Is		100,000		For removal of large obstructions from cap areas.
Removal of docks and large obstructions	1.	1		,		·
Removal of docks and large obstructions			• •	45	\$ 723,000	Includes ${f 1}$ ft of sand bedding and ${f 1}$ ft sand cover for the amended cap area.
Removal of docks and large obstructions Procure and place sand backfill/cap	16,074	ton	\$			
<u> </u>	16,074 60,800	ton sf	\$	25	\$ 1,520,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Procure and place sand backfill/cap Purchase and place AquagateTM with Organoclay	60,800	sf	\$	25	, ,	
Procure and place sand backfill/cap					, ,	Placement of 4-inch layer of OC cap material (Aquagate-OC) Placement of 4-inch layer of AC cap material (Aquagate-OC)
Procure and place sand backfill/cap Purchase and place AquagateTM with Organoclay	60,800	sf	\$	25	\$ 450,000	Placement of 4-inch layer of AC cap material (Aquagate-OC)
Procure and place sand backfill/cap Purchase and place AquagateTM with Organoclay Purchase and place AquagateTM with Powdered Activated Carbon Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and	60,800 45,000 3,674	sf sf ton	\$ \$	25 10 70	\$ 450,000 \$ 257,000	Placement of 4-inch layer of AC cap material (Aquagate-OC) Assume a thickness of 1 foot Based on an assumed average removal rate and cap production rate of
Procure and place sand backfill/cap Purchase and place AquagateTM with Organoclay Purchase and place AquagateTM with Powdered Activated Carbon Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring	60,800 45,000 3,674 20	sf sf	\$	25 10	\$ 450,000 \$ 257,000 \$ 118,000	Placement of 4-inch layer of AC cap material (Aquagate-OC) Assume a thickness of 1 foot Based on an assumed average removal rate and cap production rate of
Procure and place sand backfill/cap Purchase and place AquagateTM with Organoclay Purchase and place AquagateTM with Powdered Activated Carbon Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtot	60,800 45,000 3,674 20	sf sf ton day	\$ \$ \$	25 10 70	\$ 450,000 \$ 257,000 \$ 118,000 \$ 3,153,000	Placement of 4-inch layer of AC cap material (Aquagate-OC) Assume a thickness of 1 foot Based on an assumed average removal rate and cap production rate of
Procure and place sand backfill/cap Purchase and place AquagateTM with Organoclay Purchase and place AquagateTM with Powdered Activated Carbon Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring	60,800 45,000 3,674 20	sf sf ton	\$ \$	25 10 70	\$ 450,000 \$ 257,000 \$ 118,000	Placement of 4-inch layer of AC cap material (Aquagate-OC) Assume a thickness of 1 foot Based on an assumed average removal rate and cap production rate of



Number 2.6 39 39 320 327 37 310 3,111	unit acre Is cy cy cy day ton ton ton ton day	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 60 14 48	\$ \$ \$ \$ \$	17,000 100,000	For removal of large obstructions from cap areas. Diver assisted dredging around shoreline structures	
99 99 920 920 937 937 947 9410	cy cy day ton ton ton ton	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	100,000 60 14 48 10 5	\$ \$ \$ \$ \$	100,000 4,000 1,000 30,000 6,000	·	
99 99 920 920 937 937 947 9410	cy cy day ton ton ton ton	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	100,000 60 14 48 10 5	\$ \$ \$ \$ \$	100,000 4,000 1,000 30,000 6,000	·	
99 120 120 147 137 10 1,111	cy cy cy day ton ton ton	\$ \$ \$ \$ \$ \$ \$	60 14 48 10 5	\$ \$ \$ \$	4,000 1,000 30,000 6,000	·	
99 120 120 147 137 10 1,111	cy cy day ton ton ton	\$ \$ \$ \$ \$	14 48 10 5 201	\$ \$ \$ \$	1,000 30,000 6,000	Diver assisted dredging around shoreline structures	
220 220 447 237 10 3,111	cy day ton ton ton ton	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$	48 10 5 201	\$ \$ \$	30,000 6,000		
20 447 237 210 3,111	ton ton ton ton ton	\$ \$ \$ \$	10 5 201	\$	6,000		
37 10 3,111	ton ton ton ton ton ton	\$ \$ \$	5 201	\$			
37 10 3,111	ton ton ton	\$ \$	201		5,000	4	
710 8,111	ton ton ton	\$		\$	- 1		
,111	ton ton	\$	69		48,000		
	ton			\$	49,000		
11		\$	45	\$	140,000	Assume 2 ft thick cap.	
	day		70	\$	50,000	Assume a thickness of 1 foot.	
	1	\$	6,000	\$	23,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.	
				\$	473,000		
	% of TDC	50%		\$	236,500		
			-	Ś	709,500		
				-	103,000		
5.2	acre	\$	30.000	\$	185,000		
)	Is	\$	100,000			For removal of large obstructions from cap areas.	
34,741	ton	\$		\$		Assume 2 ft thick cap.	
14,141	ton	Ψ	45	Ψ	1,505,000	Based on an assumed average removal rate and cap production rate of	
2	day	\$	6,000			1,000 cy/day.	
.1,911	ton	\$	70	•	,	Assume a thickness of 2 feet.	
,963	су	\$	78			Assume a thickness of 6 inches.	
				\$	3,279,000		
	% of TDC	50%		\$	1,639,500		
				\$	4,918,500		
.2	acre				216,000		
	ls	\$	100,000	\$	-	For removal of large obstructions from cap areas.	
0,574	ton	\$	45	\$	1,826,000	Includes ${\bf 1}$ ft of sand bedding and ${\bf 1}$ ft sand cover for the amended cap area 2-foot cap outside amendment areas.	
.48,000	sf	\$	25	\$	3,700,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)	
,898	су	\$	27	\$	78,000	Assume thin gravel across 50% of SMA-12	
,637	ton	\$	70	\$	325,000	Assume 1-foot rock armor layer across 50% of SMA-12.	
-8	day	\$	6,000	\$	289,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.	
				\$	6,434,000		
	% of TDC	50%		\$	3,217,000		
			=	\$	9,651,000		
.0.2	acre	\$	30,000	\$	306,000		
)	ls	\$	100,000	\$	-	For removal of large obstructions from cap areas.	
.2,361	су	\$	44	\$		Assume a thickness of 6 inches.	
.2	day	\$	6,000	\$	74,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.	
	•	•		\$	924,000		
	% of TDC	50%		\$			
	TOTAL CAPITAL COSTS (Direct and Indirect)						
	0,574 48,000 898 637 3	Is	2 acre \$	2 acre \$ 30,000 s \$ 100,000 0,574 ton \$ 45 48,000 sf \$ 25 898 cy \$ 27 637 ton \$ 70 3 day \$ 6,000	% of TDC 50% \$ 2	\$ 1,639,500 \$ 4,918,500 \$ 4,918,500 \$ 216,000 \$ 1s \$ 1,00,000 \$ 0,574 \$ 1,826,000 \$ 1,	



	Qı	uantity		C	ost		
Description	Number	Unit	Unit Cost	t	Tota	I Cost	Notes
Operation & Maintenance Costs		•		•			
Upland Long-term Groundwater Monitoring							
Entire Upland Area - Groundwater Monitoring of shoreline wells	quarterly for	year 0, annua	ally for 10 y	ears, follo	owe	d by four 5-year	events
Groundwater sampling labor	30	well	\$	500		15,000	Quantity based on 30 shoreline wells including samples for field QA/QC.
Groundwater sample chemical analysis	30	well	\$	620	\$	18,600	quantity succession of street, and the mental general process that quy qui
Annual reporting	1	ls	\$	100,000		100,000	
Direct Subtot					\$	2,104,800	
Indirect 0&M Cos	ts	% of TDC	17%	=	\$	357,816	
Undiscounted Subtotal (including Indirect Cost	s)			-	\$	2,463,000	
Net Present Value Subtotal (including Indirect Cost	s)				\$	2,533,000	
Upland Cap Monitoring							
Cap monitoring, maintenance, and reporting - annual cost	1	Is	\$	30,000	\$	30,000	Assume annual monitoring for Years 1 to 10 followed by monitoring in Years 15, 20, 25 and 30.
Direct Subtot	al				\$	420,000	
Indirect O&M Cos	ts	% of TDC	17.0%	_	\$	71,400	
Undiscounted Subtotal (including Indirect Cost	\$	491,400					
Net Present Value Subtotal (including Indirect Cost	s)			-	\$	507,000	
Present worth calculated using equal series present worth analysi	s where i = 0).4 %					
Sediment cap operation and maintenance monitoring and reporting	24	acre	\$	20,000	\$	480,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
ENR operation and maintenance monitoring and reporting	10	acre	\$	12,500	\$	125,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event		%		10%	\$	2,329,100	Assume repair in Year 5, and 10 after active remedy construction.
MNR operation and maintenance monitoring and reporting	23	acre	\$	10,000	\$	230,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Institutional Controls - annual cost	1	ls	\$	25,000	\$	25,000	Assume annual costs for 30 years.
Direct Subtot	al	-	-	-	\$	12,088,200	
Indirect 0&M Cos	ts	% of TDC	17%		\$	2,054,994	
Undiscounted Subtotal (including Indirect Cost	s)			=	\$	14,143,000	
Net Present Value Subtotal (including Indirect Cost	s)				\$	14,640,000	
Total Undiscounted 0&M Costs (30 Years					\$	17,097,000	
Total Net Present Value of O&M Costs (30 Years						17,680,000	
·							
Contingency (30 Percent of Total Cos	t)				\$	17,063,000	
Total Cost of Alternative (Present Wortl	n)				\$	73,940,000	



Alternative 4 Gas Works Park Site Seattle, Washington

	Qua	antity		Cost	t	Notes
Description	Number	Unit	Unit Cost	_	tal Cost	
Capital Costs (Direct and Indirect)	•		•	•		
GWMA-1, SMA-1 and SMA-2						
Upland earthwork temporary controls (erosion control, temporary facilities,	1	Is	\$ 100,000) \$	100 000	Assumed to apply to all upland work.
access controls)	<u> </u>	15	Ψ 100,000		100,000	Absumed to apply to an apiana work.
Air and Dust Monitoring	60	day	\$ 500	\$	30,000	Assume perimeter and work area dust monitoring using hand-held real-time
				1.		dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	ls	\$ 150,000) \$	150,000	Costs include mobilization, setup, rental, demobilization, treatment and
Stormwater collection, water collection from material stockpile areas (from dewatering), treatment, and discharge system during construction	1	Is	\$ 100,000	\$	100,000	discharge.
Clear and Grub trees up to 12" diameter	1	acre	\$ 13,546	3 \$	14,000	
·	4		·		·	Cost includes screening and handling of oversized debris encountered durin
Soil Excavation (upto 15 feet)	4,775	су	\$ 14	\$	67,000	excavation.
Dewatering System - Shallow Excavation	1	ls	\$ 50,000	\$	50,000	Assumed to apply to tar mound excavation work. Includes water collection
	4,775	OV	\$ 5	5 \$	24,000	and off-site management.
On-site stockpiling and management of excavated material	4,775	су	φ 3) 	24,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	5,516	ton	\$ 201	L \$	1,109,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C
landfill						landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Transport (truck), incinerate and dispose soil at hazardous waste facility in						Assume 25% soil from tar mound excavation is classified as hazardous and
(Aragonite, Utah)	1,839	ton	\$ 1,008	3 \$	1,853,000	requires incineration. Based on soil unit weight conversion (1.4 tons/cy) for
Rough grade for cap surface preparation	1	ls	\$ 3,240) \$	3,000	the site. Cap area to be rough graded is less than 1 acre.
Procure and Install Geotextile	3,582	sy	\$ 2.98		11,000	oup area to be rough graded is less than I dere.
Cap drainage layer - import, place, compact	657	су	\$ 63	3 \$	41,000	Assume 6 inch thick layer of drainage rock (i.e, Type 17).
Procure and Place Topsoil	1,970	су	\$ 56	\$	·	Assume 1.5 ft thick layer of topsoil.
Hydroseeding	3,582	sy	\$ 3	4	11,000	
Post-construction upland survey Shoreline Restoration	1	each	\$ 3,571 \$ 100,000	+		Final as-built survey for upland construction.
Mobilization and Demobilization	4	ls each	\$ 100,000 \$ 13,155	+	100,000 53,000	In-Situ Chemical Fixation (ISCF) mob and demob.
			,		<u> </u>	Includes labor, equipment, injection point drilling and reagent costs. Assum
ISCF Reagent Application	1	ls	\$ 300,000	\$	300,000	4 events.
Process Monitoring	1	ls	\$ 120,000) \$	120.000	ISCF process monitoring, new wells, sample collection and analysis.
			, ,,,,,,,	<u> </u>	-,	
Institutional Controls/Restrictive Covenants Preparation	1	ls	\$ 75,000	\$	75,000	Assumed cost for initial setup of institutional controls for uplands and inwater work.
Direct Capital Cost Subtotal				\$	4,325,000	
Indirect Capital Cost	į	% of TDC	509	% \$	2,162,500	
Total Capital Cost	t			\$	6,487,500	
SMA-3						
Sediment debris sweep and disposal	1.0	acre	\$ 30,000	+-	30,000	
Removal of docks and large obstructions	0	ls	\$ 100,000) \$	-	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$ 325,000	\$	163,000	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	9,778	су	\$ 49	\$	479,000	
Handling and dewatering of sediment from land-based excavation	9,778	су	\$ 15	5 \$	147,000	
	,				,	
Handling of water drained from excavated sediment	10	day	\$ 10,000	\$	100,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	3,361	ton	\$ 201	L \$	676,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	10,083	ton	\$ 69	\$	696,000	
Procure and place sand backfill/cap	3,831	ton	\$ 45	5 \$	172,000	Assume 2 ft and 4 ft thick cap.
						Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume
Purchase and Install Reactive Core MatTM Organoclay	15,600	sf	\$ 26	\$		ft sand bedding and 1 ft sand cover. Sand costs accounted for under
						capping. Assume placement of 5,000 sf per day.
				+		
						Multiplied unit cost by a factor of 2 due to RCM thickness at 2 cm. Assume
Purchase and Install Reactive Core MatTM Granular Activated Carbon	28,300	sf	\$ 26	\$	736,000	ft sand bedding and 1 ft sand cover. Sand costs accounted for under capping. Assume placement of 5,000 sf per day.
			<u> </u>	\perp		
Amended cap media: Zero-Valent Iron	24,889	lb		3 \$		Assume application of 5% ZVI.
Prepare amended cap blend	178	су	\$ 7	7 \$	1,000	Mixing sand with 5% ZVI.
Amended Cap placement	178	су	\$ 51	L \$	9,000	Placement of sand blended with 5% ZVI. Assume 12-inch thick amended ca
Construction Best Management Practices (BMPs) Maintenance and	17	day	\$ 6,000	, ,	102,000	Based on an assumed average removal rate and cap production rate of
Monitoring		day	·			1,000 cy/day.
Procure and place armor stone for erosion protection	2,590	ton	\$ 70		,	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	809	су	\$ 78	\$ \$	· · · · · · · · · · · · · · · · · · ·	Assume a thickness of 6 inches.
Direct Capital Cost Subtotal Indirect Capital Cost		% of TDC	50%	\$	4,036,000 2,018,000	
Total Capital Cost		70 OI 1DO	30%	<u>\$</u>		
rotai Capitai Cost				Þ	0,004,000	



Property		Oua	ntity		С	ost	
Marie of American State 1	Description			Unit Cost			Notes
Column C	SMA-4	•					
Montane processor and proces						. ,	
Column C	Removal of docks and large obstructions	0	ls	\$ 1	L00,000	\$ -	For removal of large obstructions from cap areas.
Security of Section Content and Association Security Content and Sec	Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$ 3	325,000	\$ 163,000	Assume costs are split between SMA-3 and SMA-4
Section Continue continue continue continue Continue continue Continue conti	Sediment excavation using land-based excavation equipment	2,756	су	\$	49	\$ 135,000	
Section Continue continue continue continue Continue continue Continue conti	Handling and dewatering of sediment from land-based excavation	2.756	CV	\$	15	\$ 41,000	
Section Process Proc				·		·	
Page 1965 1975			day	1	,	,	
Section Company Comp		947	ton	\$		\$ 190,000	
The control of the control c	Transport (truck/train) and dispose soil to Subtitle D landfill	2,842	ton	\$	69	\$ 196,000	
Marie and all administrations	Procure and place sand backfill/cap	1,368	ton	\$	45	\$ 62,000	
Process response report place promoted by the control of the con	Procure and Install Geotextile	3,700	SV	\$	2.98	\$ 11,000	сар.
Control of plane decomposition for the control of	Procure and place Impormable Liner	2 700	cf	¢	2.00	\$ 7,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
From the field of the description of the presentation of the prese	Trocure and place impermeable Lines	3,700	31	Ψ	2.00	7,000	
Common parameter and an elemental parameter 1925 19 19 19 19 19 19 19 1	Procure and place geocomposite gas collection layer	120	lf	\$	6.00	\$ 1,000	
Part	Procure and place armor stone for erosion protection	735	ton	\$	70	\$ 51.000	
Second Process Proce	Procure and place fish mix on armor rock to fill interstitial voids	230	су	\$	78	\$ 18,000	Assume a thickness of 6 inches.
Section Proceed on the Company of the Company o	· · · · · · · · · · · · · · · · · · ·	5	day	\$	6,000	\$ 31,000	
March Marc		<u> </u>	,	<u> </u>	.,	·	1,000 cy/day.
Part	·		% of TDC	50%		, ,,,,,,,,	
Secrept days access and cases as a control of the	·		76 OI IDC	30%	:		
Section of continue to a continue to the con	•	•				3 1,322,300	
Separate intermediate includes and experience processed 1981 1 1 1 1 1 1 1 1 1		0.6	acre	\$	30,000	\$ 18,000	
Control process of process and process of		1	ls	<u> </u>	,	\$ 100,000	For removal of large obstructions from cap areas.
Section Sect			-	<u> </u>		¥ 2.,000	Diver assisted dredging around shoreline structures
Control Cont		.	-	<u> </u>		,	
Bayes for example of the control forcing in the control of the c		-		<u> </u>			
Section Process of the continue of the con			1	<u> </u>			
Procure on critical part of the country of the co		993	ton	\$	201	\$ 200,000	
Procurs and place search (CMI)/rep. 2,575 Wh. 5				·		,	
Procure and vales are the celebritudy	Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$	69	\$ 206,000	Assume 2 ft thick can Includes cond hadding (6 inches) for law permachility
Processor of facet floatements	Procure and place sand backfill/cap	2,878	ton	\$	45	\$ 130,000	
Procue and piece groundening seal collection risper 100 1	Procure and Install Geotextile	7,600	sy	\$	2.98	\$ 23,000	
Procure entry passe apposition plant content to here 100 F \$ 6.00 \$ 1.00 \$ \$ \$ \$ \$ \$ \$ \$ \$	Procure and place Impermeable Liner	7 600	sf	\$	2 00	\$ 15,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
Procuse and place and societies and societies and societies and procused and position may an amort mate for ill motivation words. 1,000	Trocare and place imperincable times	7,000	31	<u> </u>	2.00	10,000	
Procure and place a new offence for excess productions 1,041	Procure and place geocomposite gas collection layer	200	lf	\$	6.00	\$ 1,000	Assume geocomposite gas collection strips embedded in the sand layer with
Procuse and passes fish in interestics (Mining Marine Procuses of Mining Marine Procuses of Mi	Procure and place armor stone for erosion protection	1.541	ton	\$	70	\$ 108.000	
Mariene Section Sect	·						
Monitoring	Construction Best Management Practices (BMPs) Maintenance and	8	day	\$	6,000	\$ 47,000	Based on an assumed average removal rate and cap production rate of
Material Content	-		uuy	Ψ	0,000	·	1,000 cy/day.
Second Continue	•		0/ of TDC	E00/		, ,,,,,,,,	
Sector S	•		% 01 TDC	50%	:		
Section of devices sweep and disposal 2.3 services \$ 8 30,000 2 60,000 Procuse and place and based Markill Year 12,983 on 8 7 9 9 9 9 9 9 9 9 9	<u> </u>					3 1,017,000	
Procuse and stock award books award books for remoin grotection 5,96		2.3	acre	\$	30,000	\$ 69,000	
Procure and global amone store for erosion protection \$9.96 On \$ \$ 7 \$ \$ \$ \$ \$ \$ \$	Removal of docks and large obstructions	0	ls	<u> </u>			For removal of large obstructions from cap areas.
Procuse and place fish miss on amonr cook to fill interestation loses 1,552 0		1		<u> </u>			
Direct Capital Cost Subtotal Indirect Capital Cost Subtotal	·	<u> </u>		<u> </u>			
Monitoring						,	
Marker	, ,	21	day	\$	6,000	\$ 124,000	
Sediment debris sweep and disposal 1.95 scre scre screen sc	Direct Capital Cost Subtotal					\$ 1,335,000	
Sediment dobris sweep and disposal 1.95	•		% of TDC	50%	;		
Sediment debris series and disposal 1.95	•					\$ 2,002,500	
Removal of docks and large obstructions 0	7	1 95	acre	k	30,000	\$ 59,000	
Procure and places and backfill/cap		0	+			,	For removal of large obstructions from cap areas.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital		17,241		•			
Monitoring 17		2,519	ton	\$	70	\$ 176,000	
Direct Capital Cost Subtotal Indirect Capital Cost Soft Capital Cost Capital Cost Soft Capital Cost C		17	day	\$	6,000	\$ 103,000	
SMA-9 Total Capital Cost No frow No fr		1	I	<u> </u>		\$ 1.114,000	2,000 by/ day.
SMAS Sediment debris sweep and disposal 0.6 acre \$ 30,000 \$ 18,000 For removal of large obstructions from cap areas. Procure and place sand backfil/cap 6,611 ton \$ 45 298,000 Assume 4 thick cap. Procure and place armor stone for erosion protection 76 ton \$ 70 \$ 53,000 Assume 4 thick cap. Construction Best Management Practices (BMPs) Maintenance and Monitoring 76 ton \$ 70 \$ 40,000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. SMAS Direct Capital Cost Subtotal Indirect Capital Cost butors * 70	•		% of TDC	50%			
Sediment debris sweep and disposal 0.6 acre \$ 30,000 \$ 18,000 \$ 1	•				:		
Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place armor stone for erosion protection Procure and place AquagateTM with Organoclay Procure and place armor stone for erosion protection Procure and place armor stone for erosion protection Procure and place AquagateTM with Organoclay Procure and place AquagateTM wi	·					, , , ,	
Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place sand place AquagateTM with Prowdered Activated Carbon Signature Procure and place armor stone for erosion protection Signature Procure and place sand place AquagateTM with Organoclay Procure and place armor stone for erosion protection Signature Procure and place armor stone for erosion protection Signature Procure and place armor stone for erosion protection Signature Procure and place armor stone for erosion protection Signature S						·	
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Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Ind		-					
Indirect Capital Cost Total Capital Cost Subtotal Indirect Capital Cost	, ,	/	аау	\$	6,000	\$ 40,000	
SMA-9 Sediment debris sweep and disposal 2.8 acre \$ 30,000 \$ 85,000 Removal of docks and large obstructions 1 Is \$ 100,000 \$ 100,000 For removal of large obstructions from cap areas. Procure and place sand backfill/cap 27,222 ton \$ 45 \$ 1,225,000 Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Purchase and place AquagateTM with Powdered Activated Carbon 13,000 sf \$ 10 \$ 130,000 Placement of 4-inch layer of AC cap material (Aquagate-AC) Purchase and place AquagateTM with Organoclay 38,000 sf \$ 25 \$ 950,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Procure and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring 14 day \$ 6,000 \$ 185,000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day.	•						
Sediment debris sweep and disposal 2.8 acre \$ 30,000 \$ 85,000 Removal of docks and large obstructions 1 Is \$ 100,000 \$ 100,000 For removal of large obstructions from cap areas. Procure and place sand backfill/cap 27,222 ton \$ 45 \$ 1,225,000 Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Purchase and place AquagateTM with Powdered Activated Carbon 13,000 sf \$ 100,000 Flacement of 4-inch layer of AC cap material (Aquagate-AC) Purchase and place AquagateTM with Organoclay 38,000 sf \$ 25 \$ 950,000 Flacement of 4-inch layer of OC cap material (Aquagate-OC) Procure and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring 14 and 2	•		% of TDC	50%	:		
Sediment debris sweep and disposal Removal of docks and large obstructions 1 Is \$ 100,000 \$ 100,000 For removal of large obstructions from cap areas. Procure and place sand backfill/cap 27,222 ton \$ 45 \$ 1,225,000 Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Purchase and place AquagateTM with Powdered Activated Carbon 13,000 sf \$ 10 \$ 130,000 Placement of 4-inch layer of AC cap material (Aquagate-AC) Purchase and place AquagateTM with Organoclay 38,000 sf \$ 25 \$ 950,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Procure and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost **Of TDC** **Of TDC** **Of TDC** **Of TDC** **Of TDC** **On,000 \$ 100,000 For removal of large obstructions from cap areas. **Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. **Includes 1 ft of sand bedding and	•					\$ 613,500	
Removal of docks and large obstructions 1 Is \$ 100,000 \$ 100,000 For removal of large obstructions from cap areas. Procure and place sand backfill/cap 27,222 ton \$ 45 \$ 1,225,000 \$ Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Purchase and place AquagateTM with Powdered Activated Carbon 13,000 sf \$ 10 \$ 130,000 Placement of 4-inch layer of AC cap material (Aquagate-AC) Purchase and place AquagateTM with Organoclay 38,000 sf \$ 25 \$ 950,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Procure and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring 31 day \$ 6,000 \$ 185,000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Direct Capital Cost Subtotal Sudden Subtotal Indirect Capital Cost Subtotal Sudden		2.8	acre	\$	30.000	\$ 85,000	
Procure and place sand backfill/cap 27,222 ton \$\$ 45 \$\$ 1,225,000 Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Purchase and place AquagateTM with Powdered Activated Carbon 13,000 sf \$\$ 10 \$\$ 130,000 Placement of 4-inch layer of AC cap material (Aquagate-AC) Purchase and place AquagateTM with Organoclay 38,000 sf \$\$ 25 \$\$ 950,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Procure and place armor stone for erosion protection 3,674 ton \$\$ 70 \$\$ 257,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring \$\$ 49,000 \$\$ 185,000 \$\$ 185,000 \$\$ 185,000 \$\$ 1,000 cy/day. Direct Capital Cost Subtotal 1,000 cy/day.		1		1 -			For removal of large obstructions from cap areas.
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Purchase and place AquagateTM with Organoclay 88,000 sf \$ 25 \$ 950,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Procure and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost 8 of TDC 50% 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC cap material (Aquagate-OC) 1000 placement of 4-inch layer of OC c	Trocare and place saind backling cap	£1,444	1011	*	40	¥ 1,220,000	the amended cap area.
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost No f TDC 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. \$ 2,932,000 \$ 1,466,000	Purchase and place AquagateTM with Powdered Activated Carbon	13,000	sf	\$	10	\$ 130,000	Placement of 4-inch layer of AC cap material (Aquagate-AC)
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost No f TDC 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. \$ 2,932,000 \$ 1,466,000		38.000	sf	\$	25	\$ 950,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost **Of TDC** **Of TDC** **I85,000* **I85,000* **Based on an assumed average removal rate and cap production rate of 1,000 cy/day. **2,932,000* **1,466,0		,	ļ-·	, ,	20		
Direct Capital Cost Subtotal Indirect Capital Cost * 2,932,000 * 1,466,000		3,674	ton	\$	70	\$ 257,000	
Indirect Capital Cost % of TDC 50% \$ 1,466,000	Procure and place armor stone for erosion protection					, , , , , , ,	
· · · · · · · · · · · · · · · · · · ·	Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring	31				\$ 185,000	Based on an assumed average removal rate and cap production rate of
10tal Capital Cost \$ 4,398,000	Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal	31	day	\$		\$ 185,000 \$ 2,932,000	Based on an assumed average removal rate and cap production rate of
	Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost	31	day	\$		\$ 185,000 \$ 2,932,000 \$ 1,466,000	Based on an assumed average removal rate and cap production rate of



	Quantity		C	ost			
Description	Number	Unit	Unit C	ost	Total	Cost	Notes
SMA-10	•	•	•		•		
Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$	17,000	
Removal of docks and large obstructions	1	ls	\$	100,000	\$	100,000	For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	69	су	\$	60	\$	4,000	Diver assisted dredging around structures in the Marina
Dewatering of hydraulically dredged sediment	69	су	\$	14	\$	1,000	
Sediment removal by mechanical dredging (barge-mounted)	620	су	\$	48	\$	30,000	
Gravity dewatering on the barge	620	#REF!	\$	10	\$	6,000	
Barge transport to rail facility	947	ton	\$	5	\$	5,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	237	ton	\$	201	\$	48,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	710	ton	\$	69	\$	49,000	
Procure and place sand backfill/cap	3,111	ton	\$	45	\$	140,000	Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	711	ton	\$	70	\$	50,000	Assume a thickness of 1 foot.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	5	day	\$	6,000	\$	27,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota	l				\$	477,000	
Indirect Capital Cos		% of TDC	50%		\$	238,500	
Total Capital Cos					Ś	715,500	
SMA-11	•				<u> </u>	120,000	
Sediment debris sweep and disposal	6.2	acre	\$	30,000	\$	185,000	
Removal of docks and large obstructions	0.2	Is	\$	100,000	\$	183,000	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	34,741	ton	\$	45	\$		Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	11.911	ton	\$	70	\$		Assume a thickness of 2 feet.
Procure and place affilial storie for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	4,963		\$	78	\$,	Assume a thickness of 6 inches.
	4,903	су	Φ	10	Φ	367,000	
Construction Best Management Practices (BMPs) Maintenance and Monitoring	52	day	\$	6,000		310,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota					\$	3,279,000	
Indirect Capital Cos	t	% of TDC	50%		\$	1,639,500	
Total Capital Cos	t				\$	4,918,500	
SMA-12							
Sediment debris sweep and disposal	7.2	acre	\$	30,000	\$	216,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	59,759	ton	\$	45	\$	2,689,000	Assume 4 ft thick cap.
Procure and place 6-inch layer of pea gravel for armor	2,898	су	\$	27	\$	78,000	Assume thin gravel across 50% of SMA-12
Procure and place armor stone for erosion protection	4,637	ton	\$	70	\$	325,000	Assume 1-foot rock armor layer across 50% of SMA-12.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	67	day	\$	6,000	\$	404,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota	l				\$	3,712,000	
Indirect Capital Cos	t	% of TDC	50%		\$	1,856,000	
Total Capital Cos	t				\$	5,568,000	
SMA-13							
Sediment debris sweep and disposal	10.2	acre	\$	30,000	\$	306,000	
Removal of docks and large obstructions	0	Is	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place enhanced natural recovery (ENR) layer	12,361	су	\$	44	\$	544,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	12	day	\$	6,000	\$	74,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota					\$	924,000	
Indirect Capital Cos	t	% of TDC	50%		\$	462,000	
Total Capital Cos					ŝ	1,386,000	
TOTAL CAPITAL COSTS (Direct and Indirect)						36,954,000	



	Qua	ntity		С	ost		
Description	Number	Unit	Unit Cos	st	Tota	al Cost	Notes
Operation & Maintenance Costs							
Upland Long-term Groundwater Monitoring							
Entire Upland Area - Groundwater Monitoring of shoreline wells q	uarterly for y	ear 0, annua	lly for 10	years, foll	owe	d by four 5-year	events
Groundwater sampling labor	30	well	\$	500	\$	15,000	Quantity based on 30 shoreline wells including samples for field QA/QC.
Groundwater sample chemical analysis	30	well	\$	620		18,600	quantity successful event and the montaining sumples for field Qiy Qo.
Annual reporting	1	ls	\$	100,000	\$	100,000	
Direct Subtotal					\$	2,104,800	
Indirect 0&M Costs		% of TDC	17%	,	\$	357,816	
Undiscounted Subtotal (including Indirect Costs)				•	\$	2,463,000	
Net Present Value Subtotal (including Indirect Costs)					\$	2,533,000	
Upland Cap Monitoring							
Cap monitoring, maintenance, and reporting - annual cost	1	ls	\$	30,000	\$	30,000	Assume annual monitoring for Years 1 to 10 followed by monitoring in Years 15, 20, 25 and 30.
Direct Subtotal					\$	420,000	
Indirect O&M Costs		% of TDC	17.0%		\$	71,400	
Undiscounted Subtotal (including Indirect Costs)				·	\$	491,000	
Net Present Value Subtotal (including Indirect Costs)					\$	507,000	
Sediment - Capping, ENR, MNR and ICs						,	
Sediment cap operation and maintenance monitoring and reporting	24	acre	\$	20,000	\$	480,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
ENR operation and maintenance monitoring and reporting	10	acre	\$	12,500	\$	125,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event		%		10%	\$	2,031,100	Assume repair in Year 5, and 10 after active remedy construction.
MNR operation and maintenance monitoring and reporting	23	acre	\$	10,000	\$	230,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Present worth calculated using equal series present worth analysis where i = 0.4% $$	1	ls	\$	25,000	\$	25,000	Assume annual costs for 30 years.
Direct Subtotal					\$	11,492,200	
Indirect O&M Costs		% of TDC	17%		\$	1,953,674	
Undiscounted Subtotal (including Indirect Costs)				;	\$	13,446,000	
Net Present Value Subtotal (including Indirect Costs)					\$	13,927,000	
Total Undiscounted 0&M Costs (30 Years)					\$	16,400,000	
Total Net Present Value of O&M Costs (30 Years)						16,967,000	
· · · · · · · · · · · · · · · · · · ·						•	
Contingency (30 Percent of Total Cost)					\$	16,176,000	
Total Cost of Alternative (Present Worth)					\$	70,100,000	



Alternative 5 Gas Works Park Site Seattle, Washington

		ntity		cost	
Description	Number	Unit	Unit Cost	Total Cost	Notes
Capital Costs (Direct and Indirect) GWMA-1, SMA-1 and SMA-2					
Upland earthwork temporary controls (erosion control, temporary facilities, access controls)	1	ls	\$ 100,000	\$ 100,000	Assumed to apply to all upland work.
Air and Dust Monitoring	60	day	\$ 500	\$ 30,000	Assume perimeter and work area dust monitoring using hand-held real-time dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	ls	\$ 150,000	\$ 150,000	
Stormwater collection, water collection from material stockpile areas (from	1	ls	\$ 100,000	\$ 100,000	Costs include mobilization, setup, rental, demobilization, treatment and discharge.
dewatering), treatment, and discharge system during construction Clear and Grub trees up to 12" diameter	1	acre	\$ 13,546		distributed.
Soil Excavation (upto 15 feet)	4,775	су	\$ 14		Cost includes screening and handling of oversized debris encountered during excavation.
Dewatering System - Shallow Excavation	1	Is	\$ 50,000	\$ 50,000	Assumed to apply to tar mound excavation work. Includes water collection and off-site management.
On-site stockpiling and management of excavated material	4,775	су	\$ 5	\$ 24,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	5,516	ton	\$ 201	\$ 1,109,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Transport (truck), incinerate and dispose soil at hazardous waste facility in (Aragonite, Utah)	1,839	ton	\$ 1,008	\$ 1,853,000	Assume 25% soil from tar mound excavation is classified as hazardous and requires incineration. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Rough grade for cap surface preparation	1	ls	\$ 3,240		Cap area to be rough graded is less than 1 acre.
Procure and Install Geotextile Cap drainage layer - import, place, compact	3,582 657	cy cy	\$ 2.98 \$ 63	\$ 11,000 \$ 41.000	Assume 6 inch thick layer of drainage rock (i.e, Type 17).
Procure and Place Topsoil	1,970	су	\$ 56		Assume 1.5 ft thick layer of topsoil.
Hydroseeding	3,582	sy	\$ 3	\$ 11,000	
Post-construction upland survey Shoreline Restoration	1	each Is	\$ 3,571 \$ 100,000	\$ 4,000 \$ 100,000	Final as-built survey for upland construction.
Mobilization and Demobilization	4	each	\$ 100,000	, ,	In-Situ Chemical Fixation (ISCF) mob and demob.
ISCF Reagent Application	1	ls	\$ 300,000	\$ 300,000	Includes labor, equipment, injection point drilling and reagent costs. Assume 4 events.
Process Monitoring	1	ls	\$ 120,000	\$ 120,000	ISCF process monitoring, new wells, sample collection and analysis.
Institutional Controls/Restrictive Covenants Preparation	1	ls	\$ 75,000	\$ 75,000	Assumed cost for initial setup of institutional controls for uplands and inwater work.
Direct Capital Cost Subtotal		0/ -4.TD0	50%	\$ 4,325,000	
Indirect Capital Cost Total Capital Cost		% of TDC	50%	\$ 2,162,500 \$ 6,487,500	
SMA-3				, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Sediment debris sweep and disposal	1.0 0	acre Is	\$ 30,000 \$ 100,000		For removel of large obstructions from our group
Removal of docks and large obstructions	4		,		For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	9,778	ls	\$ 325,000 \$ 49	\$ 163,000	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment		су			
Handling and dewatering of sediment from land-based excavation	9,778	cy .	\$ 15	·	
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	10	day	\$ 10,000	\$ 100,000	
landfill	3,361	ton	\$ 201	\$ 676,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	10,083	ton	\$ 69	\$ 696,000	Assume Off Abial control banks and banks (Circles) for law and a banks (Circles)
Procure and place sand backfill/cap	3,831	ton	\$ 45	\$ 172,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap.
Procure and Install Geotextile	28,300	sy	\$ 2.98	\$ 84,000	
Procure and place Impermeable Liner	28,300	sf	\$ 2.00	\$ 57,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item.
Procure and place geocomposite gas collection layer	600	lf	\$ 6.00	\$ 4,000	Assume geocomposite gas collection strips embedded in the sand layer with
Procure and place armor stone for erosion protection					a spacing of 10 feet on center.
	2,590	ton			Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	2,590 809	ton cy	\$ 78	\$ 63,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches.
				\$ 63,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal	809 17	cy day	\$ 78 \$ 6,000	\$ 63,000 \$ 102,000 \$ 2,954,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost	809 17	су	\$ 78	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal	809 17	cy day	\$ 78 \$ 6,000	\$ 63,000 \$ 102,000 \$ 2,954,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal	809 17 0.3	cy day % of TDC	\$ 78 \$ 6,000 50% \$ 30,000	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions	809 17	cy day % of TDC acre	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ -	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area	0.3 0	cy day % of TDC acre Is	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ - \$ 163,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment	0.3 0 1 2,756	cy day % of TDC acre Is Is	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ - \$ 163,000 \$ 135,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation	0.3 0 1 2,756 2,756	cy day % of TDC acre Is Cy cy	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ - \$ 163,000 \$ 135,000 \$ 41,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment	0.3 0 1 2,756 2,756	cy day % of TDC acre Is cy cy day	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ - \$ 163,000 \$ 135,000 \$ 41,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	0.3 0 1 2,756 2,756 10	cy day % of TDC acre Is cy cy day ton	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ \$ 163,000 \$ 135,000 \$ 100,000 \$ 190,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill	0.3 0 1 2,756 2,756 10 947 2,842	cy day % of TDC acre Is cy cy day ton ton	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ - \$ 163,000 \$ 135,000 \$ 41,000 \$ 100,000 \$ 190,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap	0.3 0 1 2,756 2,756 10 947 2,842 1,368	cy day % of TDC acre Is cy cy day ton ton	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ - \$ 163,000 \$ 135,000 \$ 41,000 \$ 190,000 \$ 196,000 \$ 62,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill	0.3 0 1 2,756 2,756 10 947 2,842	cy day % of TDC acre Is cy cy day ton ton	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ 163,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 62,000 \$ 11,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile	0.3 0 1 2,756 2,756 10 947 2,842 1,368 3,700	cy day % of TDC acre Is cy cy day ton ton sy	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ 163,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 62,000 \$ 11,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner	0.3 0 1 2,756 2,756 10 947 2,842 1,368 3,700 3,700	cy day % of TDC acre Is Cy cy day ton ton sy sf	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ - \$ 163,000 \$ 135,000 \$ 41,000 \$ 190,000 \$ 196,000 \$ 62,000 \$ 11,000 \$ 7,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner Procure and place geocomposite gas collection layer Procure and place fish mix on armor rock to fill interstitial voids	0.3 0 1 2,756 2,756 10 947 2,842 1,368 3,700 3,700	cy day % of TDC acre Is Is cy cy day ton ton ton sy sf	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ 163,000 \$ 135,000 \$ 190,000 \$ 190,000 \$ 196,000 \$ 11,000 \$ 1,000 \$ 1,000 \$ 1,000 \$ 1,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center. Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner Procure and place geocomposite gas collection layer Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring	0.3 0 1 2,756 2,756 10 947 2,842 1,368 3,700 3,700 120 735 230 5	cy day % of TDC acre Is Is Cy cy day ton ton ton sy sf	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00 \$ 6.00	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ 163,000 \$ 135,000 \$ 190,000 \$ 190,000 \$ 190,000 \$ 1,000 \$ 1,000 \$ 1,000 \$ 31,000 \$ 31,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center. Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner Procure and place geocomposite gas collection layer Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and	0.3 0 1 2,756 2,756 10 947 2,842 1,368 3,700 3,700 120 735 230 5	cy day % of TDC acre Is Is cy cy day ton ton sy sf If ton cy	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00 \$ 6.00 \$ 70	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 9,000 \$ 163,000 \$ 135,000 \$ 41,000 \$ 190,000 \$ 196,000 \$ 12,000 \$ 1,000 \$ 1,000 \$ 1,000 \$ 1,000	Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center. Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of



		antity	1		Cost	-
Description	Number	Unit	Unit Cos	st	Total Cost	Notes
SMA-5	1	_			1.	T
Sediment debris sweep and disposal	0.6	acre	\$	30,000	,	
Removal of docks and large obstructions	289	ls	\$	100,000		For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head) Dewatering of hydraulically dredged sediment	289	cy cy	\$	14		Diver assisted dredging around shoreline structures
Sediment removal by mechanical dredging (barge-mounted)	2.600	су	\$	48	,	
Gravity dewatering on the barge	2,600	су	\$	10		
Barge transport to rail facility	3,972	ton	\$	5		
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	000		_	004		
landfill	993	ton	\$	201	\$ 200,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$	69	\$ 206,000	
Procure and place sand backfill/cap	2.878	ton	\$	45	\$ 130,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
<u> </u>					,	сар.
Procure and Install Geotextile	7,600	sy	\$	2.98	\$ 23,000	
Procure and place Impermeable Liner	7,600	sf	\$	2.00	\$ 15,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item.
						Assume geocomposite gas collection strips embedded in the sand layer with
Procure and place geocomposite gas collection layer	200	lf	\$	6.00	\$ 1,000	a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	1,541	ton	\$	70	\$ 108,000	· · ·
Procure and place fish mix on armor rock to fill interstitial voids	481	су	\$	78		Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	0	1	_	0.000	47.000	Based on an assumed average removal rate and cap production rate of
Monitoring	8	day	\$	6,000	\$ 47,000	1,000 cy/day.
Direct Capital Cost Subto	al	•			\$ 1,078,000	
Indirect Capital Co	st	% of TDC	50%		\$ 539,000	
Total Capital Co	st				\$ 1,617,000	
SMA-6					• •	
Sediment debris sweep and disposal	2.3	acre	\$	30,000	\$ 69,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	12,963	ton	\$	45	\$ 583,000	Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	5,926	ton	\$	70	\$ 415,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	1,852	су	\$	78	\$ 144,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	21	day	\$	6,000	\$ 124,000	Based on an assumed average removal rate and cap production rate of
Monitoring		uay	Ψ	0,000	Ψ 124,000	1,000 cy/day.
Direct Capital Cost Subto	al				\$ 1,335,000	
Indirect Capital Co	st	% of TDC	50%		\$ 667,500	
Total Capital Co	st				\$ 2,002,500	
SMA-7						
Sediment debris sweep and disposal	2.0	acre	\$	30,000	\$ 59,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	11,019	ton	\$	45	\$ 496,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area.
1 rocure and place sand backing cap	11,010	ton	Ψ	43	Ψ 490,000	includes 1 it of saild bedding and 1 it saild cover for the amended cap area.
Purchase and place AquagateTM with Powdered Activated Carbon	20,000	sf	\$	10	\$ 200.000	Placement of 4-inch layer of AC cap material (Aquagate-AC)
					,	, , , , , , , , , , , , , , , , , , , ,
Purchase and place AquagateTM with Organoclay	46,800	sf	\$	25		Placement of 4-inch layer of OC cap material (Aquagate-OC)
Amended cap media: Zero-Valent Iron	248,889	lb	\$			Assume application of 5% ZVI.
Prepare amended cap blend	1,778	су	\$	7	\$ 12,000	Mixing sand with 5% ZVI.
Amended Cap placement	1,778	су	\$	51	\$ 91,000	Placement of sand blended with 5% ZVI. Assume 12-inch thick amended ca
Produce and place armor stone for erosion protection	2,519	ton	\$	70	\$ 176,000	Assume a thickness of 1 feet.
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and	2,519	ton	Φ	70	\$ 176,000	
Monitoring	15	day	\$	6,000	\$ 92,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subto	al				\$ 3,043,000	
Indirect Capital Co		% of TDC	50%		\$ 1,521,500	
Total Capital Co		70 01 120	0070		\$ 4,564,500	
SMA-8	3L				3 4,304,300	
Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$ 18,000	<u> </u>
Removal of docks and large obstructions	0.6	ls	\$	100,000		For removal of large obstructions from cap areas.
-				,		
Procure and place sand backfill/cap	3,306	ton	\$	45	\$ 149,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area
Purchase and place AquagateTM with Organoclay	25,500	sf	\$	25	\$ 638,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Procure and place armor stone for erosion protection	756	ton	\$	70		
Construction Best Management Practices (BMPs) Maintenance and	4	day	\$	6.000	¢ 04.000	Based on an assumed average removal rate and cap production rate of
Monitoring	4	day	\$	6,000	\$ 24,000	1,000 cy/day.
Direct Capital Cost Subto	al				\$ 882,000	
Indirect Capital Co	st	% of TDC	50%		\$ 441,000	
	st				\$ 1,323,000	1
Total Capital Co					*	•
Total Capital Co						
•	2.8	acre	\$	30,000	\$ 85,000	
SMA-9	_	acre Is	\$	30,000		For removal of large obstructions from cap areas.
SMA-9 Sediment debris sweep and disposal	_	-			\$ 100,000	
SMA-9 Sediment debris sweep and disposal Removal of docks and large obstructions	2.8	Is	\$	100,000	\$ 100,000 \$ 1,225,000	Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for
SMA-9 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap	2.8 1 27,222	ls ton	\$	100,000	\$ 100,000 \$ 1,225,000 \$ 130,000	Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Placement of 4-inch layer of AC cap material (Aquagate-AC)
SMA-9 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Purchase and place AquagateTM with Powdered Activated Carbon	2.8 1 27,222 13,000	ls ton sf	\$ \$ \$	100,000 45 10	\$ 100,000 \$ 1,225,000 \$ 130,000 \$ 950,000	Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Placement of 4-inch layer of AC cap material (Aquagate-AC) Placement of 4-inch layer of OC cap material (Aquagate-OC)
SMA-9 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Purchase and place AquagateTM with Powdered Activated Carbon Purchase and place AquagateTM with Organoclay	2.8 1 27,222 13,000 38,000 3,674	ton sf sf ton	\$ \$ \$ \$	100,000 45 10 25 70	\$ 100,000 \$ 1,225,000 \$ 130,000 \$ 950,000 \$ 257,000	Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Placement of 4-inch layer of AC cap material (Aquagate-AC) Placement of 4-inch layer of OC cap material (Aquagate-OC) Assume a thickness of 1 foot.
SMA-9 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Purchase and place AquagateTM with Powdered Activated Carbon Purchase and place AquagateTM with Organoclay Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring	2.8 1 27,222 13,000 38,000 3,674 31	ton sf	\$ \$ \$	100,000 45 10 25	\$ 100,000 \$ 1,225,000 \$ 130,000 \$ 950,000 \$ 257,000 \$ 185,000	Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Placement of 4-inch layer of AC cap material (Aquagate-AC) Placement of 4-inch layer of OC cap material (Aquagate-OC) Assume a thickness of 1 foot.
SMA-9 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Purchase and place AquagateTM with Powdered Activated Carbon Purchase and place AquagateTM with Organoclay Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subto	2.8 1 27,222 13,000 38,000 3,674 31	ton sf sf ton	\$ \$ \$ \$	100,000 45 10 25 70	\$ 100,000 \$ 1,225,000 \$ 130,000 \$ 950,000 \$ 257,000 \$ 185,000 \$ 2,932,000	Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Placement of 4-inch layer of AC cap material (Aquagate-AC) Placement of 4-inch layer of OC cap material (Aquagate-OC) Assume a thickness of 1 foot. Based on an assumed average removal rate and cap production rate of
SMA-9 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Purchase and place AquagateTM with Powdered Activated Carbon Purchase and place AquagateTM with Organoclay Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring	2.8 1 27,222 13,000 38,000 3,674 31	ton sf sf ton	\$ \$ \$ \$	100,000 45 10 25 70	\$ 100,000 \$ 1,225,000 \$ 130,000 \$ 950,000 \$ 257,000 \$ 185,000	Assume 4 ft thick cap. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. Placement of 4-inch layer of AC cap material (Aquagate-AC) Placement of 4-inch layer of OC cap material (Aquagate-OC) Assume a thickness of 1 foot. Based on an assumed average removal rate and cap production rate of



	Qua	antity		C	ost		
Description	Number	Unit	Unit C	ost	Total	Cost	Notes
SMA-10	•	•	•		•		
Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$	17,000	
Removal of docks and large obstructions	1	ls	\$	100,000	\$	100,000	For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	69	су	\$	60	\$	4,000	Diver assisted dredging around structures in the Marina
Dewatering of hydraulically dredged sediment	69	су	\$	14	\$	1,000	
Sediment removal by mechanical dredging (barge-mounted)	620	су	\$	48	\$	30,000	
Gravity dewatering on the barge	620	#REF!	\$	10	\$	6,000	
Barge transport to rail facility	947	ton	\$	5	\$	5,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	237	ton	\$	201	\$	48,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	710	ton	\$	69	\$	49,000	
Procure and place sand backfill/cap	3,111	ton	\$	45	\$	140,000	Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	711	ton	\$	70	\$	50,000	Assume a thickness of 1 foot.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	5	day	\$	6,000	\$	27,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota	İ	•	•		\$	477,000	
Indirect Capital Cos	t	% of TDC	50%		\$	238,500	
Total Capital Cos					Ś	715,500	
SMA-11	•				<u> </u>	120,000	
Sediment debris sweep and disposal	6.2	acre	\$	30,000	\$	185,000	
Removal of docks and large obstructions	0.2	Is	\$	100,000	\$	183,000	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	34,741	ton	\$	45	\$		Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	11.911	ton	\$	70	\$		Assume a thickness of 2 feet.
Procure and place affilial storie for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	4.963		\$	78	\$,	Assume a thickness of 6 inches.
	4,903	су	Φ	10	Φ	367,000	
Construction Best Management Practices (BMPs) Maintenance and Monitoring	52	day	\$	6,000		310,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota					\$	3,279,000	
Indirect Capital Cos	t	% of TDC	50%	\$	\$	1,639,500	
Total Capital Cos	t				\$	4,918,500	
SMA-12							
Sediment debris sweep and disposal	7.2	acre	\$	30,000	\$	216,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	59,759	ton	\$	45	\$	2,689,000	Assume 4 ft thick cap.
Procure and place 6-inch layer of pea gravel for armor	2,898	су	\$	27	\$	78,000	Assume thin gravel across 50% of SMA-12
Procure and place armor stone for erosion protection	4,637	ton	\$	70	\$	325,000	Assume 1-foot rock armor layer across 50% of SMA-12.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	67	day	\$	6,000	\$	404,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota	I				\$	3,712,000	
Indirect Capital Cos	t	% of TDC	50%		\$	1,856,000	
Total Capital Cos	t				\$	5,568,000	
SMA-13							
Sediment debris sweep and disposal	10.2	acre	\$	30,000	\$	306,000	
Removal of docks and large obstructions	0	Is	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place enhanced natural recovery (ENR) layer	12,361	су	\$	44	\$	544,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	12	day	\$	6,000	\$	74,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota	I				\$	924,000	
Indirect Capital Cos	t	% of TDC	50%		\$	462,000	
Total Capital Cos					ŝ	1,386,000	
TOTAL CAPITAL COSTS (Direct and Indirect)						38,934,000	



	Qu	antity		С	ost		
Description	Number	Unit	Unit Cost	t	Tota	I Cost	Notes
Operation & Maintenance Costs							
Upland Long-term Groundwater Monitoring							
Entire Upland Area - Groundwater Monitoring of shoreline wells q	uarterly for	year 0, annua	Illy for 10 y			d by four 5-year	events
Groundwater sampling labor	30	well	\$	500		15,000	Quantity based on 30 shoreline wells including samples for field QA/QC.
Groundwater sample chemical analysis	30	well	\$	620		18,600	terming and the second
Annual reporting	1	ls	\$	100,000		100,000	
Direct Subtota	I				\$	2,104,800	
Indirect O&M Costs	5	% of TDC	17%		\$	357,816	
Undiscounted Subtotal (including Indirect Costs)				\$	2,463,000	
Net Present Value Subtotal (including Indirect Costs)				\$	2,533,000	
Upland Cap Monitoring							
Cap monitoring, maintenance, and reporting - annual cost	1	ls	\$	30,000	\$	30,000	Assume annual monitoring for Years 1 to 10 followed by monitoring in Years 15, 20, 25 and 30.
Direct Subtota	I				\$	420,000	
Indirect O&M Costs	5	% of TDC	17.0%		\$	71,400	
Undiscounted Subtotal (including Indirect Costs)				\$	491,400	
Net Present Value Subtotal (including Indirect Costs)				\$	507,000	
Sediment - Capping, ENR, MNR and ICs						· · · · · · · · · · · · · · · · · · ·	
Present worth calculated using equal series present worth analysis where i = 0.4%	24	acre	\$	20,000	\$	480,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
ENR operation and maintenance monitoring and reporting	10	acre	\$	12,500	\$	125,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event		%		10%	\$	2,163,100	Assume repair in Year 5, and 10 after active remedy construction.
MNR operation and maintenance monitoring and reporting	23	acre	\$	10,000	\$	230,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Institutional Controls - annual cost	1	Is	\$	25,000	\$	25,000	Assume annual costs for 30 years.
Direct Subtota	I				\$	11,756,200	
Indirect O&M Costs	5	% of TDC	17%		\$	1,998,554	
Undiscounted Subtotal (including Indirect Costs)				\$	13,755,000	
Net Present Value Subtotal (including Indirect Costs					\$	14,243,000	
Total Undiscounted 0&M Costs (30 Years	•				\$	16,709,000	•
Total Net Present Value of O&M Costs (30 Years	•					17,283,000	
•	-						
Contingency (30 Percent of Total Cost)				\$	16,865,000	
Total Cost of Alternative (Present Worth)				\$	73,080,000	



Alternative 6 Gas Works Park Site Seattle, Washington

		ntity		ost	
Description	Number	Unit	Unit Cost	Total Cost	Notes
Capital Costs (Direct and Indirect) GWMA-1, SMA-1 and SMA-2					
Upland earthwork temporary controls (erosion control, temporary facilities, access controls)	1	ls	\$ 100,000	\$ 100,000	Assumed to apply to all upland work.
Air and Dust Monitoring	60	day	\$ 500	\$ 30,000	Assume perimeter and work area dust monitoring using hand-held real-time dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	Is	\$ 150,000	\$ 150,000	
Stormwater collection, water collection from material stockpile areas (from	1	ls	\$ 100,000	\$ 100,000	Costs include mobilization, setup, rental, demobilization, treatment and discharge.
dewatering), treatment, and discharge system during construction Clear and Grub trees up to 12" diameter	1	acre	\$ 13,546	\$ 14,000	discribings.
Soil Excavation (upto 15 feet)	4,775	су	\$ 14	, , , , , , , , ,	Cost includes screening and handling of oversized debris encountered durin excavation.
Dewatering System - Shallow Excavation	1	Is	\$ 50,000	\$ 50,000	Assumed to apply to tar mound excavation work. Includes water collection and off-site management.
On-site stockpiling and management of excavated material	4,775	су	\$ 5	\$ 24,000	-
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	5,516	ton	\$ 201	\$ 1,109,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Transport (truck), incinerate and dispose soil at hazardous waste facility in (Aragonite, Utah)	1,839	ton	\$ 1,008	\$ 1,853,000	Assume 25% soil from tar mound excavation is classified as hazardous and requires incineration. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Rough grade for cap surface preparation	1	Is	\$ 3,240		Cap area to be rough graded is less than 1 acre.
Procure and Install Geotextile Cap drainage layer - import, place, compact	3,582 657	cy cy	\$ 2.98 \$ 63	\$ 11,000 \$ 41.000	Assume 6 inch thick layer of drainage rock (i.e, Type 17).
Procure and Place Topsoil	1,970	су	\$ 56		Assume 1.5 ft thick layer of topsoil.
Hydroseeding	3,582	sy .	\$ 3	\$ 11,000	
Post-construction upland survey Shoreline Restoration	1	each Is	\$ 3,571 \$ 100,000	\$ 4,000 \$ 100,000	Final as-built survey for upland construction.
Mobilization and Demobilization	4	each	\$ 13,155	, ,	In-Situ Chemical Fixation (ISCF) mob and demob.
ISCF Reagent Application	1	ls	\$ 300,000	\$ 300,000	Includes labor, equipment, injection point drilling and reagent costs. Assume 4 events.
Process Monitoring	1	Is	\$ 120,000	\$ 120,000	ISCF process monitoring, new wells, sample collection and analysis.
Institutional Controls/Restrictive Covenants Preparation	1	Is	\$ 75,000	\$ 75,000	Assumed cost for initial setup of institutional controls for uplands and inwater work.
Direct Capital Cost Subtotal				\$ 4,325,000	
Indirect Capital Cost Total Capital Cost		% of TDC	50%	\$ 2,162,500 \$ 6,487,500	
SMA-3				0,401,300	
Sediment debris sweep and disposal	1.0	acre	\$ 30,000	\$ 30,000	
Removal of docks and large obstructions	0	ls	\$ 100,000	-	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	ls	\$ 325,000	·	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	9,778	су	\$ 49	\$ 479,000	
Handling and dewatering of sediment from land-based excavation	9,778	су	\$ 15	·	
Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	10	day	\$ 10,000	\$ 100,000	
landfill	3,361	ton	\$ 201	\$ 676,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	10,083	ton	\$ 69	\$ 696,000	
Procure and place sand backfill/cap	3,831	ton	\$ 45	\$ 172,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeabilit cap.
Procure and Install Geotextile	28,300	sy	\$ 2.98	\$ 84,000	
Procure and place Impermeable Liner	28,300	sf	\$ 2.00	\$ 57,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item.
Procure and place geocomposite gas collection layer	600	lf	\$ 6.00	\$ 4,000	Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	2,590	ton	\$ 70	4 101 000	Assume a thickness of O fact
Procure and place fish mix on armor rock to fill interstitial voids					Assume a thickness of 2 feet.
	809	су	\$ 78	\$ 63,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	17			\$ 63,000	
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal	17	cy day	\$ 78 \$ 6,000	\$ 63,000 \$ 102,000 \$ 2,954,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost	17	су	\$ 78	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4	17	cy day	\$ 78 \$ 6,000	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal	0.3	cy day % of TDC	\$ 78 \$ 6,000 50% \$ 30,000	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 8,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions	17	cy day % of TDC acre Is	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 8,000 \$ -	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area	0.3	cy day % of TDC acre Is	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 8,000 \$ - \$ 325,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment	0.3 0 1 2,756	cy day % of TDC acre Is Is	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 8,000 \$ - \$ 325,000 \$ 135,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation	0.3 0 1 2,756 2,756	cy day % of TDC acre Is Cy cy	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ - \$ 325,000 \$ 135,000 \$ 41,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	0.3 0 1 2,756	cy day % of TDC acre Is Is	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ - \$ 325,000 \$ 135,000 \$ 41,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment	0.3 0 1 2,756 2,756	cy day % of TDC acre Is cy cy day	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill	0.3 0 1 2,756 2,756 10 947 2,842	cy day % of TDC acre Is cy cy day ton	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 8,000 \$ - \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap	0.3 0 1 2,756 2,756 10 947 2,842	cy day % of TDC acre Is Is cy cy day ton ton	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 325,000 \$ 135,000 \$ 41,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 44,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill	0.3 0 1 2,756 2,756 10 947 2,842	cy day % of TDC acre Is cy cy day ton ton	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 44,000 \$ 27,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile	0.3 0 1 2,756 2,756 10 947 2,842 972 9,000	cy day % of TDC acre Is Cy cy day ton ton sy	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 27,000 \$ 18,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeabilit cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner	0.3 0 1 2,756 2,756 10 947 2,842 972 9,000 9,000 200 711	cy day % of TDC acre Is Cy cy day ton ton ton sy sf	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00 \$ 6.00	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 8,000 \$ - \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 27,000 \$ 18,000 \$ 1,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner Procure and place geocomposite gas collection layer Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	0.3 0 1 2,756 2,756 10 947 2,842 972 9,000 9,000	cy day % of TDC acre Is Is cy cy day ton ton ton sy sf	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 27,000 \$ 1,000 \$ 1,000 \$ 1,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center. Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner Procure and place geocomposite gas collection layer Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and Monitoring	0.3 0 1 2,756 2,756 10 947 2,842 972 9,000 9,000 200 711 222 5	cy day % of TDC acre Is Is Cy cy day ton ton ton sy sf	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00 \$ 6.00	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 27,000 \$ 1,000 \$ 1,000 \$ 2,000 \$	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center. Assume a thickness of 2 feet.
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-4 Sediment debris sweep and disposal Removal of docks and large obstructions Shoring and/or coffer dam install for excavation in lakeshore area Sediment excavation using land-based excavation equipment Handling and dewatering of sediment from land-based excavation Handling of water drained from excavated sediment Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Procure and place sand backfill/cap Procure and Install Geotextile Procure and place Impermeable Liner Procure and place geocomposite gas collection layer Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and	0.3 0 1 2,756 2,756 10 947 2,842 972 9,000 9,000 200 711 222 5	cy day % of TDC acre Is Is cy cy day ton ton sy sf If ton cy	\$ 78 \$ 6,000 50% \$ 30,000 \$ 100,000 \$ 325,000 \$ 49 \$ 15 \$ 10,000 \$ 201 \$ 69 \$ 45 \$ 2.98 \$ 2.00 \$ 6.00 \$ 70	\$ 63,000 \$ 102,000 \$ 2,954,000 \$ 1,477,000 \$ 4,431,000 \$ 8,000 \$ - \$ 325,000 \$ 135,000 \$ 100,000 \$ 190,000 \$ 196,000 \$ 1,000 \$ 1,000 \$ 1,000	Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume costs are split between SMA-3 and SMA-4 Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability cap. Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center. Assume a thickness of 2 feet. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of



SMA-5 Sediment debris sweep and disposal Removal of docks and large obstructions Sediment removal by hydraulic dredging (Suction head) Sediment removal by hydraulic dredging (Suction head) Sediment removal by hydraulically dredged sediment Sediment removal by mechanical dredging (barge-mounted) Sediment remov		Oua	ntity		С	ost	
Mary Company	Description			Unit Cost			Notes
Control of the American Control of Control	·						
Section Process Company Comp	Sediment debris sweep and disposal	0.6	acre	\$ 3	30,000	\$ 18,000	
Section Proceedings Process		1	ls				
Section Control Cont						, , , , , , , , , , , , , , , , , , , ,	Diver assisted dredging around shoreline structures
Section of the company of the comp							
Page			1			,	
The content of the content of the first of the first of the content of the cont			1			· · · · · · · · · · · · · · · · · · ·	
Lange Control Contro		,	ton		_	, ,,,,,,,	
Process of the second second process of the second process of th		993	ton	\$	201	\$ 200,000	
The content of the	Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$	69	\$ 206,000	
Propose of page companies gar on blooks by	Dragura and place cond backfill /con	1 605	ton	¢	45	¢ 76,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
Process of plane in processor before a contribution for the new results and section from Section Association (1997) 1.00 1	Procure and place Sand backing cap	1,000	ton	Φ	45	\$ 76,000	сар.
Miles Mile	Procure and Install Geotextile	26,000	sy	\$	2.98	\$ 78,000	
Process and pairs per contents up to describe height of the contents of the	Procure and place Impermeable Liner	26,000	sf	\$	2.00	\$ 52,000	· ·
Process of plates and process of colors and process of the plane of	, ,	,				· · · · · · · · · · · · · · · · · · ·	
Name of about many and in the following process of the comment o	Procure and place geocomposite gas collection layer	600	lf	\$	6.00	\$ 71000	
Controlled by Management (1) From control of the State of the Controlled by Management (1) From Controlled	Procure and place armor stone for erosion protection	1 5/11	ton	¢	70		· · · · · · · · · · · · · · · · · · ·
Part Control and the designant of Procince (1974) Set with rest or and process of the Control of Process of Process of Process of Control of Process o		,					
Private Capital Cost Selection Very 12 Very 12 Very 13 \$ 0,000 \$	·	.01				,	
Page	, ,	7	day	\$	6,000		
March Marc	Direct Capital Cost Subtotal	I.	I			\$ 1,112,000	
Section Control of Section	Indirect Capital Cost		% of TDC	50%		\$ 556,000	
Section of the control decreased place are to the control of the	Total Capital Cost				:	\$ 1,668,000	
The manufact of the count trianger after with the second production in the count of the production of the count of the c	SMA-6					, ,	
Procure and places are to be following 19	Sediment debris sweep and disposal	2.3	acre	\$ 3	30,000	\$ 69,000	
Processed and action and action and some control of protection and action action and action action and action action and action	Removal of docks and large obstructions	0	Is	\$ 10	00,000	\$ -	For removal of large obstructions from cap areas.
Construction for Management Personnel Management	Procure and place sand backfill/cap	· ·	ton				·
Commence						,	
Part	·	1,852	су	\$	78	\$ 144,000	Assume a thickness of 6 inches.
Section Process Proc	, ,	21	dav	\$	6.000	\$ 124.000	
Marie			,	*	-,		1,000 cy/day.
The color of the	-					+ 2,000,000	
Security of times assess price of pages of the process of the pr	·		% of TDC	50%	:	•	
Somewhat cross twenty and organized 20	•					\$ 2,002,500	
Personal of lates and higher desirations (1904 and higher search self-like operations) 1,018 1,0		0.0	T.	I 4 0	20.000	† 50.000	
Procure and place and leach fill (cop)	· · · ·	2.0					For a second of least a horizontal second se
### And the anti-other Analysis of Man Department Ministry of Application of Control (Managane Analysis) #### Analysis of pre-act and state of the Analysis of Ana	Removal of docks and large obstructions	0	IS	\$ 10	00,000	5 -	For removal of large obstructions from cap areas.
Purchase and place laying et Marke this Digenoraty	Procure and place sand backfill/cap	11,019	ton	\$	45	\$ 496,000	Includes ${f 1}$ ft of sand bedding and ${f 1}$ ft sand cover for the amended cap area.
Purchase and place laying et Marke this Digenoraty							
Previous environ terms of some for certain presentation 1,776 0	Purchase and place AquagateTM with Powdered Activated Carbon	20,000	sf	\$	10	\$ 200,000	Placement of 4-inch layer of AC cap material (Aquagate-AC)
Presence amonded size literal 1.778 9	Purchase and place AquagateTM with Organoclay	46,800	sf	\$	25	\$ 1,170,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Prince and place amone statement for treation protections 2,519 one 3 0,00 5 0,000 5 0,000 1		248,889	lb	\$	3		
Procure and place ammer stane for orosing protection 2,519 5 670 5 9,000 5	Prepare amended cap blend	1,778	су	\$	7	\$ 12,000	Mixing sand with 5% ZVI.
Procure and place ammer stane for orosing protection 2,519 5 670 5 9,000 5	Amended Con placement	1 770		φ.	E 1	¢ 01.000	Discoment of count blanded with E0/ 71/1 Assume 10 inch thick amended con
Direct Capital Cost Subtrata Subsequence Plantieurs (RMPs) Mulminores and Lage production and an American Subsequence Plantieurs (RMPs) Mulminores and Lage production and an American Subsequence Plantieurs (RMPs) Mulminores and Lage production and an American Subsequence Plantieurs (RMPs) Mulminores and Lage Subsequence Plantieurs (RMPs) Mu	Amended Cap placement	1,778	су	\$	51	\$ 91,000	Placement of sand blended with 5% ZVI. Assume 12-Inch thick amended cap.
Maritaning	Procure and place armor stone for erosion protection	2,519	ton	\$	70	\$ 176,000	Assume a thickness of 1 feet.
Direct Capital Cost Section Cost Section Secti	Construction Best Management Practices (BMPs) Maintenance and	15	dav	\$	6 000	\$ 92,000	Based on an assumed average removal rate and cap production rate of
Marcian Marc	-		uuy	Ψ	0,000	Ψ 32,000	1,000 cy/day.
Second Coccos and disposed Coccos Cocco	Direct Capital Cost Subtotal					\$ 3,043,000	
Softment debris sweep and disposed 0.6 Jose 1.00,000 1.0	Indirect Capital Cost		% of TDC	50%		\$ 1,521,500	
Sectioner definits sower and disposed 0.6 are 8 30,000 8 18,000 18 Fire removal of large obstructions from operation 7,000 18 18 208,000 18 208,000 18 2	Total Capital Cost				•	\$ 4,564,500	
Procure and place and baseful range present of structs and baseful range production (and production) 6.61 0	SMA-8						
Procure and place aand backfli/cap Procure and place same store for execsion protection Procure and place among store for execsion protection Procure and place among store for execsion protection Construction Best Management Practices (BMPs) Maintenance and 7	Sediment debris sweep and disposal						
Procure and place ammore store for enrisone protection			ls				
Construction Best Management Practices (BMPs) Menterance and Maniforing Procure and place Aguagatar M with Organically South Procure and place Aguagatar M with Organical South Procure Aguagatar M with Organica	, · · · · · · · · · · · · · · · · · · ·	,					·
Monitoring Mon	· · · · · · · · · · · · · · · · · · ·	756	ton	\$	70		
Note 100	, ,	7	day	\$	6,000	\$ 44.000	
No. 10 10 10 10 10 10 10 1			,	•	-,		1,000 cy/day.
SMA-9	-					,	
Sediment debris sweep and disposal 2.8 acre \$ 30,000 \$ For removal of large obstructions from cap areas. Procure and place sand backfill/cap 16,074 ton \$ \$ 45 \$ 723,000 Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap areas. Purchase and place AquagateTM with Organoclay 60,800 of \$ \$ 25 \$ 1,520,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Purchase and place AquagateTM with Powdered Activated Carbon 45,000 of \$ \$ 10 \$ 450,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Purchase and place AquagateTM with Powdered Activated Carbon 45,000 of \$ \$ 10 \$ 450,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Purchase and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a trickness of 1 foot Construction Best Management Practices (BMPs) Maintenance and Monitoring 10 Pirect Capital Cost 5 subtoat 1 Indirect Capital Cost 5 voltage 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	·		% of TDC	50%	:	\$ 206,500	
Sediment debris sweep and disposal 2.8 acre 5 3.0000 5 5.000						\$ 619,500	
Removal of docks and large obstructions Procure and place sand backfil/cap Procure and place sand backfil/cap Purchase and place AquagateTM with Organoclay Burchase and place AquagateTM with Powdered Activated Carbon Procure and place among stone for erosion protection Procure and place and stone for erosion protection Procure and place among stone for erosion pr		1	1	T			
Procure and place sand backfill/cap 16,074 ton \$ \$ 45 \$ 723,000 Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area of place AquagateTM with Organoclay 60,800 sf \$ 2.5 \$ 1.520,000 Placement of 4-inch layer of OC cap material (Aquagate-OC) Purchase and place AquagateTM with Powdered Activated Carbon 45,000 sf \$ 10 \$ 450,000 Placement of 4-inch layer of AC cap material (Aquagate-OC) Procure and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Indirect Capital Cost SMA-10 Sediment debris sweep and disposal and argo obstructions 1 Is \$ 100,000 \$ 17,000 Sediment removal by hydraulic dredging (Suction head) 69 oy \$ 14 \$ 1,000 Dewatering of hydraulically dredging (Suction head) 69 oy \$ 14 \$ 1,000 Dewatering of hydraulically dredging (Surgion head) 69 oy \$ 14 \$ 1,000 Gravity dewatering on the barge 620 Is \$ 10 \$ 6,000 Gravity dewatering on the barge 620 Is \$ 10 \$ 6,000 Transport (truck/train) and dispose soil to Subtitle D (nazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D (nazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D (nazardous waste) and place armor stone for erosion protection Frocure and place armo		2.8	ł				
Purchase and place AquagateTM with Organoclay 60.800 sf \$ \$.525 \$.1,520,000 Placement of 4-inch layer of Oc cap material (Aquagate-Oc) Purchase and place AquagateTM with Powdered Activated Carbon 45,000 sf \$ \$.10 \$.450,000 Placement of 4-inch layer of AC cap material (Aquagate-Oc) Procure and place armor stone for erosion protection 3,674 fon \$.70 \$.257,000 Assume a thickness of 1 foot Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subto	Removal of docks and large obstructions	0	IS	\$ 10	00,000	\$ -	For removal of large obstructions from cap areas.
Purchase and place armor stone for erosion protection 3,674 ton \$70 \$257,000 Assume a thickness of 1 foot Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Indirec	Procure and place sand backfill/cap	16,074	ton	\$	45	\$ 723,000	Includes $oldsymbol{1}$ ft of sand bedding and $oldsymbol{1}$ ft sand cover for the amended cap area.
Purchase and place armor stone for erosion protection 3,674 ton \$70 \$257,000 Assume a thickness of 1 foot Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Indirec	Purchase and place AquagateTM with Organoclay	60.800	sf	\$	25	\$ 1.520,000	Placement of 4-inch laver of OC can material (Aquadate-OC)
Procure and place armor stone for erosion protection 3,674 ton \$ 70 \$ 257,000 Assume a thickness of 1 foot Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Indirect Capital Cost Subtoal Subtotal Indirect Capital Cost Subtoal Subtotal Indirect Capital Cost Subtoal Subto		,					
Construction Best Management Practices (BMPs) Maintenance and 20 day \$ 6,000 \$ 118,000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Direct Capital Cost Subtotal Indirect Capital Cost Subtoal Indirect Capital Cost Subtotal Indirect Capital	Purchase and place AquagateTM with Powdered Activated Carbon	45,000	sf	\$	10	\$ 450,000	Placement of 4-inch layer of AC cap material (Aquagate-OC)
Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Indirect Capital Cost Subtotal Indirect Capital Cost Soft Subtotal Indirect Capital Cost Subtotal Indirect Capital Capital Cost Subtotal Indirect Capital Capit	Procure and place armor stone for erosion protection	3,674	ton	\$	70	\$ 257,000	Assume a thickness of 1 foot
Monitoring Direct Capital Cost Subtotal Indirect Capital Cost % of TDC 50% \$ 3,153,000 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,576,500 \$ 1,700 \$ 1,000 \$ 1	Construction Best Management Practices (BMPs) Maintenance and	00		_	0.000	A 110,000	Based on an assumed average removal rate and cap production rate of
Indirect Capital Cost Total Capital Cost Subtotal Total Capital Cost Subtotal Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Total Capital Cost Subtotal Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Total Capital Cost Subtotal Indirect Capital Cost Subtoal Indirec	, ,	20	day	\$	6,000	\$ 118,000	
SMA-10 Sediment debris sweep and disposal 0.6 acre \$ 30,000 \$ 17,000 For removal of large obstructions from cap areas. Sediment removal by hydraulic dredging (Suction head) 69 cy \$ 14 \$ 1,000 Devatering of hydraulically dredged sediment 69 cy \$ 14 \$ 1,000 Sediment removal by mechanical dredging (Barge-mounted) 620 cy \$ 48 \$ 30,000 Devatering of hydraulically dredged sediment 69 cy \$ 14 \$ 1,000 Sediment removal by mechanical dredging (barge-mounted) 620 cy \$ 48 \$ 30,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 6,000 Devatering on the barge 620 Is \$ 10 \$ 10 \$ 10 \$ 10 \$ 10 \$ 10 \$ 10 \$ 1	-					\$ 3,153,000	
Sediment debris sweep and disposal Removal of docks and large obstructions 1 Is \$ 100,000 \$ 100,000 For removal of large obstructions from cap areas. Sediment removal by hydraulic dredging (Suction head) 69 cy \$ 14 \$ 1,000 Dewatering of hydraulically dredged sediment 69 cy \$ 14 \$ 1,000 Sediment removal by mechanical dredging (barge-mounted) 60 cy \$ 48 \$ 30,000 Gravity dewatering on the barge 620 Is \$ 10 \$ 6,000 Barge transport to rail facility Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost ** of TDC** ** of TDC** ** 50% ** 477,000 *	Indirect Capital Cost		% of TDC	50%		\$ 1,576,500	
Sediment debris sweep and disposal Removal of docks and large obstructions 1 Is \$ 100,000 \$ 100,000 For removal of large obstructions from cap areas. Sediment removal by hydraulic dredging (Suction head) 69 cy \$ 14 \$ 1,000 Dewatering of hydraulically dredged sediment 69 cy \$ 14 \$ 1,000 Sediment removal by mechanical dredging (barge-mounted) 60 cy \$ 48 \$ 30,000 Gravity dewatering on the barge 620 Is \$ 10 \$ 6,000 Barge transport to rail facility Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost ** of TDC** ** of TDC** ** 50% ** 477,000 *	Total Capital Cost				•	\$ 4,729,500	
Removal of docks and large obstructions Sediment removal by hydraulic dredging (Suction head) Sediment removal by hydraulic dredging (Suction head) Dewatering of hydraulically dredged sediment Sediment removal by mechanical dredging (barge-mounted) Sediment removal by mechanical dredging (barge-mounted) Gravity dewatering on the barge Barge transport to rail facility Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and backfill/cap Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Nof TDC Sou \$ 100,000 \$ 40,000 Diver assisted dredging obstructions from cap areas. 4,000 Diver assisted dredging around structures in the Marina 1,000 For removal of large obstructions from cap areas. 4,000 Diver assisted dredging around structures in the Marina 1,000 For removal of large obstructions from cap areas. 4,000 Diver assisted dredging around structures in the Marina 1,000 For removal of large obstructions from cap areas. 5 to 0 \$ 14 \$ 1,000 A \$ 0,000 For removal of large obstructions from cap areas. For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 Procure assisted dredging around structures in the Marina 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large obstructions from cap areas. 1,000 For removal of large satistics in the Marina 1,000 For removal of large satistics in the Marina 1,000 For removal of large satistics in the Marina	•						-
Sediment removal by hydraulic dredging (Suction head) Dewatering of hydraulically dredged sediment 69 cy \$ 14 \$ 1,000 Sediment removal by mechanical dredging (barge-mounted) Gravity dewatering on the barge G20 ls \$ 10 \$ 6,000 Barge transport to rail facility Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Procure and place sand backfill/cap Procure and place sand backfill/cap Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Monitoring Sediment removal by hydraulically dredged sediment 69 cy \$ 14 \$ 1,000 \$ 14 \$ 30,000 \$ 6,000 \$ 48,000 \$ 48,000 \$ 48,000 \$ 48,000 \$ 48,000 \$ 48,000 \$ 49,000 Assume 2 ft thick cap. Procure and place armor stone for erosion protection 711 ton \$ 70 \$ 50,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring Sediment removal by hydraulically dredged sediment Solved Sediment Solved Sediment 14 \$ 1,000 \$ 6,000 \$ 48,000 \$ 49,000 Assume 2 ft thick cap. Procure and place armor stone for erosion protection 711 ton \$ 70 \$ 50,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring Solved Sediment	Sediment debris sweep and disposal	0.6	acre	\$ 3	30,000	\$ 17,000	
Dewatering of hydraulically dredged sediment 69 cy \$ 14 \$ 1,000 Sediment removal by mechanical dredging (barge-mounted) 620 cy \$ 48 \$ 30,000 Gravity dewatering on the barge 620 Is \$ 10 \$ 6,000 Barge transport to rail facility 947 ton \$ 5 \$ 5,000 Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill 710 ton \$ 201 \$ 48,000 Transport (truck/train) and dispose soil to Subtitle D landfill 710 ton \$ 69 \$ 49,000 Procure and place samd backfill/cap 3,111 ton \$ 45 \$ 140,000 Assume 2 ft thick cap. Procure and place armor stone for erosion protection 711 ton \$ 70 \$ 50,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal Subtotal Indirect Capital Cost Subtotal Indirect Capital Capit	Removal of docks and large obstructions	1	ls	\$ 10	00,000		
Sediment removal by mechanical dredging (barge-mounted) Gravity dewatering on the barge G20 Is \$ 10 \$ 6,000 Barge transport to rail facility 947 ton \$ 5 \$ 5,000 Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose Soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train) and dispose soil to Subtitle D landfill Tion Transport (truck/train			су				Diver assisted dredging around structures in the Marina
Gravity dewatering on the barge Barge transport to rail facility 947 ton \$ 5 \$ 5,000 Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill 710 ton \$ 69 \$ 49,000 Procure and place sand backfill/cap Procure and place sam backfill/cap Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Nof TDC Sow 5 238,500							
Barge transport to rail facility 947 ton \$ 5 \$ 5,000 Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill 710 ton \$ 69 \$ 49,000 Procure and place sand backfill/cap Procure and place armor stone for erosion protection 711 ton \$ 70 \$ 50,000 Assume 2 ft thick cap. Procure and place armor stone for erosion protection 711 ton \$ 70 \$ 50,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Subtotal Indirect Capital Cost 8 of TDC 50% \$ 238,500							
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Transport (truck/train) and dispose soil to Subtitle D landfill Tol Tol Tol Tol Tol Tol Tol							
Indirect Capital Cost Subtotal		947	ton	\$	5	\$ 5,000	
Transport (truck/train) and dispose soil to Subtitle D landfill 710 ton \$ 69 \$ 49,000 Procure and place sand backfill/cap 3,111 ton \$ 45 \$ 140,000 Assume 2 ft thick cap. Procure and place armor stone for erosion protection 711 ton \$ 70 \$ 50,000 Assume a thickness of 1 foot. Construction Best Management Practices (BMPs) Maintenance and Monitoring 6 day \$ 6,000 \$ 27,000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. Direct Capital Cost Subtotal 1		237	ton	\$	201	\$ 48,000	
Procure and place sand backfill/cap Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Indirect Capital Cost Santa ton \$45 \$ 140,000 Assume 2 ft thick cap. \$5 \$ 140,000 Assume a thickness of 1 foot. \$6,000 \$ 27,000 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. \$477,000 \$ 238,500		710	ton	\$	60	\$ 40,000	
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost **Of TDC** TO** **Document Procure and place armor stone for erosion protection **One Stone Indirect Capital Cost Subtotal Indirect Capital Cost **Of TDC** **Of TDC** **Document Procure and place armor stone for erosion protection **South Stone Indirect Capital Cost **Of TDC** **Of TD	, , , , , , ,						Assume 2 ft thick can
Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost **Of TDC** **Direct Capital Cost* **Of TDC** **Of TDC** **Direct Capital Cost* **Of TDC** **Of TDC** **Direct Capital Cost* **Direct Capital Cost* **Of TDC** **Direct Capital Cost*	, ,						·
Monitoring 5 day \$ 6,000 \$ 27,000 1,000 cy/day.	·					,	
Direct Capital Cost Subtotal \$ 477,000 Indirect Capital Cost % of TDC 50% \$ 238,500	, ,	5	day	\$	6,000	\$ 27,000	
Indirect Capital Cost % of TDC 50% \$ 238,500	-	T	1	1		\$ 477.000	
· · · · · · · · · · · · · · · · · · ·	-		% of TDC	50%		, , , , , , , , , , , , , , , , , , , ,	
10tai Capitai Cost 4 110,000	·			-	:		
	File No. 0186-846-03					y 110,000	



	Qu	antity		С	ost	
Description	Number	Unit	Unit Co	st	Total Cost	Notes
SMA-11	•	•	•			
Sediment debris sweep and disposal	6.2	acre	\$	30,000	\$ 185,00	
Removal of docks and large obstructions	0	Is	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	34,741	ton	\$	45	\$ 1,563,000	
Procure and place armor stone for erosion protection	11,911	ton	\$	70	\$ 834,00	·
Procure and place fish mix on armor rock to fill interstitial voids	4,963	су	\$			
Construction Best Management Practices (BMPs) Maintenance and	.,000	-5,	1		+ 00.,00	Based on an assumed average removal rate and cap production rate of
Monitoring	52	day	\$	6,000	\$ 310,000	1,000 cy/day.
Direct Capital Cost Subtota					\$ 3,279,000	
•		0/ / 1700	50 0/		, .,	
Indirect Capital Cos	t	% of TDC	50%	;	\$ 1,639,500	
Total Capital Cos	t				\$ 4,918,500	
SMA-12						
Sediment debris sweep and disposal	7.2	acre	\$	30,000	\$ 216,00	
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	59.759	ton	\$	45	\$ 2,689,000	
Procure and place 6-inch layer of pea gravel for armor	2,898	су	\$			Assume thin gravel across 50% of SMA-12
Procure and place armor stone for erosion protection	4,637	ton	\$		\$ 325,000	
	4,037	ton	Ψ	10	φ 323,000	,
Construction Best Management Practices (BMPs) Maintenance and	67	day	\$	6,000	\$ 404,00	Based on an assumed average removal rate and cap production rate of
Monitoring						1,000 cy/day.
Direct Capital Cost Subtota					\$ 3,712,000)
Indirect Capital Cos	t	% of TDC	50%		\$ 1,856,000	<u>) </u>
Total Capital Cos	t			:	\$ 5,568,000	П
SMA-13					-,,	
Sediment debris sweep and disposal	10.2	acre	\$	30,000	\$ 306,00	
·	10.2	+	\$	100,000		
Removal of docks and large obstructions	0	ls				For removal of large obstructions from cap areas.
Procure and place enhanced natural recovery (ENR) layer	12,361	су	\$	44	\$ 544,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	12	day	\$	6,000	\$ 74,000	Based on an assumed average removal rate and cap production rate of
Monitoring	12	day	Ψ	0,000	Ψ 74,000	1,000 cy/day.
Direct Capital Cost Subtota	I				\$ 924,00	
Indirect Capital Cos	t	% of TDC	50%		\$ 462,00	
•				:	\$ 1,386,000	
Total Capital Cos	ι				\$ 1,360,000	
Entire Upland Area - Groundwater Monitoring of shoreline wells of	uarterly for y	year 0, annua	lly for 10	years, foll		
Groundwater sampling labor	30		\$			■Ouantity based on 30 shoreline wells including samples for field OA/OC
Groundwater sample chemical analysis	30	well		620		
Annual reporting	<u>]1</u>	Is	\$	100,000		
Direct Subtota					\$ 2,104,80	
Indirect 0&M Cost	5	% of TDC	17%		\$ 357,81	<u>6</u>
Undiscounted Subtotal (including Indirect Costs)			•	\$ 2,463,00	\overline{o}
Net Present Value Subtotal (including Indirect Costs)			•	\$ 2,533,00	
Upland Cap Monitoring	,				, _,,,,,,	· I
Cap monitoring, maintenance, and reporting - annual cost	1	Is	\$	30,000	\$ 30,000	Assume annual monitoring for Years 1 to 10 followed by monitoring in Year 15, 20, 25 and 30.
Direct Subtota	1		1		\$ 420,000	
Indirect O&M Cost		% of TDC	17.0%		\$ 71,400	
		70 01 120	11.070	;		
Undiscounted Subtotal (including Indirect Costs	-			,	\$ 491,000	
Net Present Value Subtotal (including Indirect Costs)				\$ 507,000)
Sediment - Capping, ENR, MNR and ICs						
Sediment cap operation and maintenance monitoring and reporting	24	acre	\$	20,000	\$ 480,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
Present worth calculated using equal series present worth analysis where i = 0.4%	10	acre	\$	12,500	\$ 125,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active
Periodic cap/ENR repair event	1	%	1	10%	\$ 2,158,20	
	1	1.	1	1070	- 2,100,200	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active
MNR operation and maintenance monitoring and reporting	23	acre	\$	10,000	\$ 230,000	remedy construction.
		ls	\$			
Institutional Controls - annual cost	11			25,000	\$ 25.000	
Institutional Controls - annual cost	<u> 1</u> 	15	<u> </u>	25,000		·
Direct Subtota		- 1	1	25,000	\$ 11,746,40	
Direct Subtota Indirect O&M Cost	5	% of TDC	17%	25,000	\$ 11,746,400 \$ 1,996,888	3
Direct Subtota	5	- 1	1	25,000	\$ 11,746,40	3
Direct Subtota Indirect O&M Cost	s)	- 1	1	25,000	\$ 11,746,400 \$ 1,996,888	3
Direct Subtota Indirect O&M Cost Undiscounted Subtotal (including Indirect Costs Net Present Value Subtotal (including Indirect Costs	s))	- 1	1	25,000	\$ 11,746,400 \$ 1,996,888 \$ 13,743,000 \$ 14,231,000	0
Direct Subtota Indirect O&M Cost Undiscounted Subtotal (including Indirect Costs Net Present Value Subtotal (including Indirect Costs Total Undiscounted O&M Costs (30 Years	s))	- 1	1	25,000	\$ 11,746,400 \$ 1,996,880 \$ 13,743,000 \$ 14,231,000 \$ 16,697,000	
Direct Subtota Indirect O&M Cost Undiscounted Subtotal (including Indirect Costs Net Present Value Subtotal (including Indirect Costs	s))	- 1	1	25,000	\$ 11,746,400 \$ 1,996,888 \$ 13,743,000 \$ 14,231,000	
Direct Subtota Indirect O&M Cost Undiscounted Subtotal (including Indirect Costs Net Present Value Subtotal (including Indirect Costs Total Undiscounted O&M Costs (30 Years Total Net Present Value of O&M Costs (30 Years	s)))	- 1	1	25,000	\$ 11,746,400 \$ 1,996,880 \$ 13,743,000 \$ 14,231,000 \$ 16,697,000 \$ 17,271,000	
Direct Subtota Indirect O&M Cost Undiscounted Subtotal (including Indirect Costs Net Present Value Subtotal (including Indirect Costs Total Undiscounted O&M Costs (30 Years	s)))	- 1	1	25,000	\$ 11,746,400 \$ 1,996,880 \$ 13,743,000 \$ 14,231,000 \$ 16,697,000	
Direct Subtota Indirect O&M Cost Undiscounted Subtotal (including Indirect Costs Net Present Value Subtotal (including Indirect Costs Total Undiscounted O&M Costs (30 Years Total Net Present Value of O&M Costs (30 Years	s)))))))))))))))))))	- 1	1	25,000	\$ 11,746,400 \$ 1,996,880 \$ 13,743,000 \$ 14,231,000 \$ 16,697,000 \$ 17,271,000	

Present worth calculated using equal series present worth analysis where i = -0.3%

Total Cost of Alternative (Present Worth)



\$ 72,970,000

Alternative 7 Gas Works Park Site Seattle, Washington

	Qua	antity			cost		
escription	Number	Unit	Unit Co	ost	Total	Cost	Notes
capital Costs (Direct and Indirect) GWMA-1, SMA-1 and SMA-2							
Upland earthwork temporary controls (erosion control, temporary facilities, access controls)	1	Is	\$	100,000	\$	100,000	Assumed to apply to all upland work.
Air and Dust Monitoring	60	day	\$	500	\$	30,000	Assume perimeter and work area dust monitoring using hand-held real-time dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	Is	\$	150,000	\$	150,000	
Stormwater collection, water collection from material stockpile areas (from dewatering), treatment, and discharge system during construction	1	Is	\$	100,000	\$	100,000	Costs include mobilization, setup, rental, demobilization, treatment and discharge.
Clear and Grub trees up to 12" diameter	1	acre	\$	13,546	\$	14,000	
Soil Excavation (upto 15 feet)	4,775	су	\$	14	\$	67,000	Cost includes screening and handling of oversized debris encountered duri excavation.
Dewatering System - Shallow Excavation	1	ls	\$	50,000	\$	50,000	Assumed to apply to tar mound excavation work. Includes water collection and off-site management.
On-site stockpiling and management of excavated material	4,775	су	\$	5	\$	24,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	5,516	ton	\$	201	\$	1,109,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Transport (truck), incinerate and dispose soil at hazardous waste facility in (Aragonite, Utah)	1,839	ton	\$	1,008	\$	1,853,000	Assume 25% soil from tar mound excavation is classified as hazardous and requires incineration. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Rough grade for cap surface preparation	1	ls	\$	3,240	\$		Cap area to be rough graded is less than 1 acre.
Procure and Install Geotextile	3,582	sy	\$	2.98	\$	11,000	
Cap drainage layer - import, place, compact	657 1,970	cy	\$	63 56	\$		Assume 6 inch thick layer of drainage rock (i.e, Type 17). Assume 1.5 ft thick layer of topsoil.
Procure and Place Topsoil Hydroseeding	3,582	cy sy	\$	30	\$	11,000	Assume 1.5 it thick layer of topson.
Post-construction upland survey	1	each	\$	3,571	\$		Final as-built survey for upland construction.
Shoreline Restoration	1	ls	\$	100,000	\$	100,000	,
Mobilization and Demobilization	4	each	\$	13,155	\$	53,000	In-Situ Chemical Fixation (ISCF) mob and demob.
ISCF Reagent Application	1	Is	\$	300,000	\$	300,000	Includes labor, equipment, injection point drilling and reagent costs. Assur 4 events.
Process Monitoring	1	Is	\$	120,000	\$	120,000	ISCF process monitoring, new wells, sample collection and analysis.
Institutional Controls/Restrictive Covenants Preparation	1	ls	\$	75,000	Î	75,000	Assumed cost for initial setup of institutional controls for uplands and inwater work.
Direct Capital Cost Subtota		0/ . CTDO		50 0/	\$	4,325,000	
Indirect Capital Cost		% of TDC		50%		2,162,500	
Total Capital Cost					\$	6,487,500	
Sediment debris sweep and disposal	1.0	acre	\$	30,000	\$	30,000	
Removal of docks and large obstructions	0	ls	\$	100,000	+	-	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$	325,000	\$	163,000	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	9,778	су	\$	49	\$	479,000	
Handling and dewatering of sediment from land-based excavation	9,778	су	\$	15		147,000	
Handling of water drained from excavated sediment	10	day	\$	10,000	\$	100,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	3,361	ton	\$	201		676,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	10,083	ton	\$	69	\$	696,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeabi
Procure and place sand backfill/cap	3,831	ton	\$	45		172,000	cap.
Procure and Install Geotextile	28,300	sy	\$	2.98	\$	84,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
Procure and place Impermeable Liner	28,300	sf	\$	2.00	\$	57,000	included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer w
Procure and place geocomposite gas collection layer Procure and place armor stone for erosion protection	600 2,590	lf ton	\$	6.00		4,000	a spacing of 10 feet on center. Assume a thickness of 2 feet.
Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	2,590 809	cy	\$	70	\$		Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	17	day	\$	6,000		102,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota					\$	2,954,000	
Indirect Capital Cost	:	% of TDC	50%		\$	1,477,000	



	Oua	ntity	1 (Cost	
Description		Unit	Unit Cost	Total Cost	Notes
SMA-4	•	ı			
Sediment debris sweep and disposal	0.3	acre	\$ 30,000	\$ 8,000	
Removal of docks and large obstructions	0	ls	\$ 100,000	\$ -	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$ 325,000	\$ 163,000	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	2,756	су	\$ 49	\$ 135,000	
	·				
Handling and dewatering of sediment from land-based excavation	2,756	су	\$ 15	\$ 41,000	
Handling of water drained from excavated sediment	10	day	\$ 10,000	\$ 100,000	
Sediment removal by mechanical dredging (barge-mounted)	0	СУ	\$ 48 \$ 10	\$ - \$ -	
Gravity dewatering on the barge Barge transport to rail facility	3,789	cy ton	\$ 5	\$ 19.000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	947	ton	\$ 201	\$ 190,000	
landfill				,	
Transport (truck/train) and dispose soil to Subtitle D landfill	2,842	ton	\$ 69	\$ 196,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
Procure and place sand backfill/cap	972	ton	\$ 45	\$ 44,000	cap.
Procure and Install Geotextile	9,000	sy	\$ 2.98	\$ 27,000	
Procure and place Impermeable Liner	9,000	sf	\$ 2.00	\$ 18,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
					included under sand cap line item.
Procure and place geocomposite gas collection layer	200	lf	\$ 6.00	\$ 1,000	Assume geocomposite gas collection strips embedded in the sand layer with a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	711	ton	\$ 70	\$ 50,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	222	су	\$ 78	\$ 17,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	5	day	\$ 6,000	\$ 28,000	Based on an assumed average removal rate and cap production rate of
Monitoring		uay	\$ 6,000		1,000 cy/day.
Direct Capital Cost Subtotal				\$ 1,037,000	
Indirect Capital Cost		% of TDC	50%	\$ 518,500	
Total Capital Cost				\$ 1,555,500	
SMA-5 Sediment debris sweep and disposal	0.6	2070	¢ 20.000	\$ 18.000	T
Sediment debris sweep and disposal Removal of docks and large obstructions	0.6	acre Is	\$ 30,000 \$ 100,000		For removal of large obstructions from cap areas.
Removal of docks and large obstructions Sediment removal by hydraulic dredging (Suction head)	289	cy	\$ 100,000	\$ 100,000	Diver assisted dredging around shoreline structures
Dewatering of hydraulically dredged sediment	289	су	\$ 14	\$ 4,000	2.101 dooloted dreaging around shoroline structures
Sediment removal by mechanical dredging (barge-mounted)	2,600	су	\$ 48	\$ 125,000	
Gravity dewatering on the barge	2,600	су	\$ 10	\$ 26,000	
Barge transport to rail facility	3,972	ton	\$ 5	\$ 20,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	993	ton	\$ 201	\$ 200,000	
landfill	0.070	.		·	
Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$ 69	\$ 206,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
Procure and place sand backfill/cap	1,685	ton	\$ 45	\$ 76,000	cap.
Procure and Install Geotextile	26,000	sy	\$ 2.98	\$ 78,000	5-44-
Dreeuve and place Impermeeble Liner	26,000	of	¢ 2.00	¢ 52,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
Procure and place Impermeable Liner	26,000	sf	\$ 2.00	\$ 52,000	included under sand cap line item.
Procure and place geocomposite gas collection layer	600	lf	\$ 6.00	\$ 4.000	Assume geocomposite gas collection strips embedded in the sand layer with
				·	a spacing of 10 feet on center.
Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	1,541 481	ton	\$ 70 \$ 78		Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	401	су			Based on an assumed average removal rate and cap production rate of
Monitoring	7	day	\$ 6,000	\$ 40,000	1,000 cy/day.
Direct Capital Cost Subtotal				\$ 1,112,000	
Indirect Capital Cost		% of TDC	50%	\$ 556,000	
Total Capital Cost				\$ 1,668,000	
SMA-6					
Sediment debris sweep and disposal	1.0	acre	\$ 30,000	\$ 30,000	
Removal of docks and large obstructions	0	ls	\$ 100,000	\$ -	For removal of large obstructions from cap areas.
Handling of water drained from excavated sediment Sediment removal by mechanical dredging (barge-mounted)	10 8,148	day cy	\$ 10,000 \$ 48	\$ 100,000 \$ 391,000	
Gravity dewatering on the barge	8,148	Is	\$ 10	\$ 81,000	
Barge transport to rail facility	11,204	ton	\$ 5	\$ 56,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	0.001	ton	¢ 201	¢ 562,000	
landfill	2,801	ton	\$ 201	\$ 563,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	8,403	ton	\$ 69	\$ 580,000	Assume O fields
Procure and place sand backfill/cap	5,704	ton	\$ 45		Assume 2 ft thick cap.
Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	2,607 815	ton	\$ 70 \$ 78		Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and		СУ		,	Based on an assumed average removal rate and cap production rate of
Monitoring	9	day	\$ 6,000	\$ 55,000	1,000 cy/day.
Direct Capital Cost Subtotal		-	-	\$ 2,360,000	
Indirect Capital Cost		% of TDC	50%	\$ 1,180,000	
Total Capital Cost	<u> </u>			\$ 3,540,000	
SMA-7					
Sediment debris sweep and disposal	2.0	acre	\$ 30,000		
Removal of docks and large obstructions	0	ls	\$ 100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	11,019	ton	\$ 45	\$ 496,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area.
B. J	00.055				
Purchase and place AquagateTM with Powdered Activated Carbon	20,000	sf	\$ 10	\$ 200,000	Placement of 4-inch layer of AC cap material (Aquagate-AC)
Purchase and place AquagateTM with Organoclay	46,800	sf	\$ 25		Placement of 4-inch layer of OC cap material (Aquagate-OC)
Amended cap media: Zero-Valent Iron	248,889	lb			Assume application of 5% ZVI.
Prepare amended cap blend	1,778	су	\$ 7	\$ 12,000	Mixing sand with 5% ZVI.
Amended Cap placement	1,778	су	\$ 51	\$ 91,000	Placement of sand blended with 5% ZVI. Assume 12-inch thick amended cap.
Procure and place armor stone for erosion protection	2,519	ton	\$ 70	\$ 176.000	Assume a thickness of 1 feet.
Construction Best Management Practices (BMPs) Maintenance and					Based on an assumed average removal rate and cap production rate of
Monitoring	15	day	\$ 6,000	\$ 92,000	1,000 cy/day.
Direct Capital Cost Subtotal				\$ 3,043,000	
Indirect Capital Cost		% of TDC	50%	\$ 1,521,500	
Total Capital Cost	<u> </u>			\$ 4,564,500	



	Qua	ıntity		С	ost		
Description	Number	Unit	Unit Co	ost	Tota	ıl Cost	Notes
SMA-8							
Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$	18,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	3,306	ton	\$	45	\$	149,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area.
Purchase and place AquagateTM with Organoclay	25,500	sf	\$	25	\$	638,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Procure and place armor stone for erosion protection	756	ton	\$	70	\$	53,000	Assume a thickness of 1 foot
Construction Best Management Practices (BMPs) Maintenance and	4	day	\$	6,000	\$	24.000	Based on an assumed average removal rate and cap production rate of
Monitoring Disease Continue Co				<u> </u>			1,000 cy/day.
Direct Capital Cost Subtotal Indirect Capital Cost		% of TDC	50%		\$ \$	882,000	
Total Capital Cost		% 01 TDC	30%	!	\$	441,000 1,323,000	
SMA-9					<u>ې</u>	1,323,000	
Sediment debris sweep and disposal	2.8	acre	\$	30,000	\$	85,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	16,074	ton	\$	45	\$	723,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area.
<u> </u>	,		\$		φ.	·	
Purchase and place AquagateTM with Organoclay	60,800	sf	\$	25	\$	1,520,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Purchase and place AquagateTM with Powdered Activated Carbon	45,000	sf	\$	10	\$	450,000	Placement of 4-inch layer of AC cap material (Aquagate-OC)
Procure and place armor stone for erosion protection	3,674	ton	\$	70	\$	257,000	Assume a thickness of 1 foot
Construction Best Management Practices (BMPs) Maintenance and	20	day	\$	6,000	\$	118,000	Based on an assumed average removal rate and cap production rate of
Monitoring		auy	Ϋ́	5,000		,	1,000 cy/day.
Direct Capital Cost Subtotal					\$	3,153,000	
Indirect Capital Cost		% of TDC	50%	:	\$	1,576,500	
Total Capital Cost					\$	4,729,500	
SMA-10 Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$	17,000	
Removal of docks and large obstructions	1	Is	\$	100,000	\$,	For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	92	су	\$	60	\$		Diver assisted dredging around structures in the Marina
Dewatering of hydraulically dredged sediment	92	су	\$	14	\$	1,000	
Sediment removal by mechanical dredging (barge-mounted)	827	су	\$	48	\$	40,000	
Gravity dewatering on the barge	827	ls	\$	10	\$	8,000	
Barge transport to rail facility	1,263	ton	\$	5	\$	6,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	316	ton	\$	201	\$	63,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	947	ton	\$	69	\$	65,000	
Procure and place sand backfill/cap	3,111	ton	\$	45	\$	140,000	Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	711	ton	\$	70	\$	50,000	Assume a thickness of 1 foot.
Construction Best Management Practices (BMPs) Maintenance and	5	day	\$	6,000	\$	28,000	Based on an assumed average removal rate and cap production rate of
Monitoring Direct Capital Cost Subtotal					\$	524,000	1,000 cy/day.
Indirect Capital Cost		% of TDC	50%		\$	262,000	
Total Capital Cost		70 01 120	00%	;	<u> </u>	786,000	
SMA-11					Ť	100,000	
Sediment debris sweep and disposal	6.2	acre	\$	30,000	\$	185,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	34,741	ton	\$	45	\$		Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	11,911	ton	\$	70	\$		Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids Construction Best Management Practices (BMPs) Maintenance and	4,963	су	\$	78	\$		Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Monitoring	52	day	\$	6,000	\$		1,000 cy/day.
Direct Capital Cost Subtotal					\$	3,279,000	
Indirect Capital Cost		% of TDC	50%		\$	1,639,500	
Total Capital Cost				;	\$	4,918,500	
SMA-12							
Sediment debris sweep and disposal	7.2	acre	\$	30,000	\$	216,000	
Removal of docks and large obstructions	0	Is	\$	100,000	\$	-	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	40,574	ton	\$	45	\$	1,826,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area. 2-foot cap outside amendment areas.
Purchase and place AquagateTM with Organoclay	148,000	sf	\$	25	\$		Placement of 4-inch layer of OC cap material (Aquagate-OC)
Procure and place 6-inch layer of pea gravel for armor	2,898	су	\$	27	\$		Assume thin gravel across 50% of SMA-12
Procure and place armor stone for erosion protection	4,637	ton	\$	70	\$		Assume 1-foot rock armor layer across 50% of SMA-12.
Construction Best Management Practices (BMPs) Maintenance and	48	day	\$	6,000	\$	289,000	Based on an assumed average removal rate and cap production rate of
Monitoring		1,]	3,000	Ļ	·	1,000 cy/day.
Direct Capital Cost Subtotal		0/ cf TDO	E00/		\$	6,434,000	
Indirect Capital Cost		% of TDC	50%	:	\$	3,217,000	
Total Capital Cost SMA-13					\$	9,651,000	
Sediment debris sweep and disposal	10.2	acre	\$	30,000	\$	306,000	
Removal of docks and large obstructions	0	Is	\$	100,000	\$,	For removal of large obstructions from cap areas.
Procure and place enhanced natural recovery (ENR) layer	12,361	су	\$	44	\$		Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	12	day	\$	6,000	\$	74,000	Based on an assumed average removal rate and cap production rate of
Monitoring] ~	3,000		·	1,000 cy/day.
Direct Capital Cost Subtotal		0/ .5===	F00:		\$	924,000	
Indirect Capital Cost		% of TDC	50%	;	\$	462,000	
Total Capital Cost					\$	1,386,000	
TOTAL CAPITAL COSTS (Direct and Indirect)					Ś	45,040,500	
,						. , ,	



	Qu	antity		С	ost		
Description	Number	Unit	Unit Cost	t	Tota	al Cost	Notes
Operation & Maintenance Costs							
Upland Long-term Groundwater Monitoring							
Entire Upland Area - Groundwater Monitoring of shoreline wells q	uarterly for	year 0, annua	Illy for 10 y	ears, foll	lowe	d by four 5-year	events
Groundwater sampling labor	30	well	\$	500		15,000	Quantity based on 30 shoreline wells including samples for field QA/QC.
Groundwater sample chemical analysis	30	well	\$	620	\$	18,600	ţ., ţ.
Annual reporting	1	Is	\$	100,000		100,000	
Direct Subtota					\$	2,104,800	
Indirect 0&M Costs	6	% of TDC	17%	;	\$	357,816	
Undiscounted Subtotal (including Indirect Costs))				\$	2,463,000	
Net Present Value Subtotal (including Indirect Costs))				\$	2,533,000	
Upland Cap Monitoring							
Cap monitoring, maintenance, and reporting - annual cost	1	Is	\$	30,000	\$	30,000	Assume annual monitoring for Years 1 to 10 followed by monitoring in Years $15,20,25$ and $30.$
Direct Subtota	l				\$	420,000	
Indirect 0&M Costs	6	% of TDC	17.0%	,	\$	71,400	
Undiscounted Subtotal (including Indirect Costs))			•	\$	491,000	
Net Present Value Subtotal (including Indirect Costs))				\$	507,000	
Sediment - Capping, ENR, MNR and ICs							
Sediment cap operation and maintenance monitoring and reporting	24	acre	\$	20,000	\$	480,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
ENR operation and maintenance monitoring and reporting	10	acre	\$	12,500	\$	125,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event		%		10%	\$	2,570,200	Assume repair in Year 5, and 10 after active remedy construction.
MNR operation and maintenance monitoring and reporting	23	acre	\$	10,000	\$	230,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Institutional Controls - annual cost	1	ls	\$	25,000	\$	25,000	Assume annual costs for 30 years.
Direct Subtota	I				\$	12,570,400	
Indirect O&M Costs	3	% of TDC	17%		\$	2,136,968	
Undiscounted Subtotal (including Indirect Costs))			;	\$	14,707,000	
Net Present Value Subtotal (including Indirect Costs))				\$	15,217,000	
Total Undiscounted O&M Costs (30 Years))				\$	17,661,000	
Total Net Present Value of O&M Costs (30 Years)						18,257,000	
Contingency (30 Percent of Total Cost))				\$	18,989,000	
Total Cost of Alternative (Present Worth))				Ś	82,290,000	



Alternative 8
Gas Works Park Site
Seattle, Washington

	Qua	antity			cost		
escription	Number	Unit	Unit Co	ost	Total	Cost	Notes
capital Costs (Direct and Indirect) GWMA-1, SMA-1 and SMA-2							
Upland earthwork temporary controls (erosion control, temporary facilities, access controls)	1	Is	\$	100,000	\$	100,000	Assumed to apply to all upland work.
Air and Dust Monitoring	60	day	\$	500	\$	30,000	Assume perimeter and work area dust monitoring using hand-held real-time dust monitoring equipment. Assume 3 months of upland construction.
Stockpile and dewatering area setup and removal	1	Is	\$	150,000	\$	150,000	
Stormwater collection, water collection from material stockpile areas (from dewatering), treatment, and discharge system during construction	1	Is	\$	100,000	\$	100,000	Costs include mobilization, setup, rental, demobilization, treatment and discharge.
Clear and Grub trees up to 12" diameter	1	acre	\$	13,546	\$	14,000	
Soil Excavation (upto 15 feet)	4,775	су	\$	14	\$	67,000	Cost includes screening and handling of oversized debris encountered duri excavation.
Dewatering System - Shallow Excavation	1	ls	\$	50,000	\$	50,000	Assumed to apply to tar mound excavation work. Includes water collection and off-site management.
On-site stockpiling and management of excavated material	4,775	су	\$	5	\$	24,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	5,516	ton	\$	201	\$	1,109,000	Assume 75% soil from tar mound excavation can be disposed at Subtitle C landfill. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Transport (truck), incinerate and dispose soil at hazardous waste facility in (Aragonite, Utah)	1,839	ton	\$	1,008	\$	1,853,000	Assume 25% soil from tar mound excavation is classified as hazardous and requires incineration. Based on soil unit weight conversion (1.4 tons/cy) for the site.
Rough grade for cap surface preparation	1	ls	\$	3,240	\$		Cap area to be rough graded is less than 1 acre.
Procure and Install Geotextile	3,582	sy	\$	2.98	\$	11,000	
Cap drainage layer - import, place, compact	657 1,970	cy	\$	63 56	\$		Assume 6 inch thick layer of drainage rock (i.e, Type 17). Assume 1.5 ft thick layer of topsoil.
Procure and Place Topsoil Hydroseeding	3,582	cy sy	\$	30	\$	11,000	Assume 1.5 it thick layer of topson.
Post-construction upland survey	1	each	\$	3,571	\$		Final as-built survey for upland construction.
Shoreline Restoration	1	ls	\$	100,000	\$	100,000	,
Mobilization and Demobilization	4	each	\$	13,155	\$	53,000	In-Situ Chemical Fixation (ISCF) mob and demob.
ISCF Reagent Application	1	Is	\$	300,000	\$	300,000	Includes labor, equipment, injection point drilling and reagent costs. Assur 4 events.
Process Monitoring	1	Is	\$	120,000	\$	120,000	ISCF process monitoring, new wells, sample collection and analysis.
Institutional Controls/Restrictive Covenants Preparation	1	ls	\$	75,000	Î	75,000	Assumed cost for initial setup of institutional controls for uplands and inwater work.
Direct Capital Cost Subtota		0/ . CTDO		50 0/	\$	4,325,000	
Indirect Capital Cost		% of TDC		50%		2,162,500	
Total Capital Cost					\$	6,487,500	
Sediment debris sweep and disposal	1.0	acre	\$	30,000	\$	30,000	
Removal of docks and large obstructions	0	ls	\$	100,000	+	-	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$	325,000	\$	163,000	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	9,778	су	\$	49	\$	479,000	
Handling and dewatering of sediment from land-based excavation	9,778	су	\$	15		147,000	
Handling of water drained from excavated sediment	10	day	\$	10,000	\$	100,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	3,361	ton	\$	201		676,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	10,083	ton	\$	69	\$	696,000	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeabi
Procure and place sand backfill/cap	3,831	ton	\$	45		172,000	cap.
Procure and Install Geotextile	28,300	sy	\$	2.98	\$	84,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
Procure and place Impermeable Liner	28,300	sf	\$	2.00	\$	57,000	included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer w
Procure and place geocomposite gas collection layer Procure and place armor stone for erosion protection	600 2,590	lf ton	\$	6.00		4,000	a spacing of 10 feet on center. Assume a thickness of 2 feet.
Procure and place armor stone for erosion protection Procure and place fish mix on armor rock to fill interstitial voids	2,590 809	cy	\$	70	\$		Assume a thickness of 2 feet. Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	17	day	\$	6,000		102,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtota					\$	2,954,000	
Indirect Capital Cost	:	% of TDC	50%		\$	1,477,000	



	Oua	intity		C	ost	
Description	Number	Unit	Unit Cos			Notes
SMA-4		•				
Sediment debris sweep and disposal	0.3	acre	\$		\$ 8,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Shoring and/or coffer dam install for excavation in lakeshore area	1	Is	\$	325,000	\$ 163,000	Assume costs are split between SMA-3 and SMA-4
Sediment excavation using land-based excavation equipment	2,756	су	\$	49	\$ 135,000	
Handling and dewatering of sediment from land-based excavation	2,756	су	\$	15	\$ 41,000	
					,	
Handling of water drained from excavated sediment Sediment removal by mechanical dredging (barge-mounted)	10	day	\$	10,000 48	\$ 100,000 \$ -	
Gravity dewatering on the barge	0	cy cy	\$		\$ -	
Barge transport to rail facility	3,789	ton	\$		\$ 19,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	947	ton	\$	201	\$ 190,000	
landfill Transport (truck/train) and dispose soil to Subtitle D landfill	2,842	ton	\$	69	\$ 196,000	
						Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
Procure and place sand backfill/cap	972	ton	\$	45	\$ 44,000	cap.
Procure and Install Geotextile	9,000	sy	\$	2.98	\$ 27,000	
Procure and place Impermeable Liner	9,000	sf	\$	2.00	\$ 18,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume included under sand cap line item.
						Assume geocomposite gas collection strips embedded in the sand layer with
Procure and place geocomposite gas collection layer	200	lf	\$	6.00	\$ 1000	a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	711	ton	\$	70	\$ 50,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	222	су	\$	78	\$ 17,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	5	day	\$	6,000	\$ 28,000	Based on an assumed average removal rate and cap production rate of
Monitoring Direct Capital Cost Subtotal				·	\$ 1,037,000	1,000 cy/day.
Indirect Capital Cost Subtotal		% of TDC	50%		\$ 1,037,000 \$ 518,500	
Total Capital Cost		70 OI 1DC	30%	:	\$ 1,555,500	
SMA-5					\$ 1,555,500	
Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$ 18,000	
Removal of docks and large obstructions	1	Is	\$	100,000		For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	289	су	\$	60		Diver assisted dredging around shoreline structures
Dewatering of hydraulically dredged sediment	289	су	\$	14	\$ 4,000	
Sediment removal by mechanical dredging (barge-mounted)	2,600	су	\$	48	\$ 125,000	
Gravity dewatering on the barge	2,600	су	\$		\$ 26,000	
Barge transport to rail facility	3,972	ton	\$	5	\$ 20,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste)	993	ton	\$	201	\$ 200,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	2,979	ton	\$	69	\$ 206,000	
·	,				,	Assume 2 ft thick cap. Includes sand bedding (6 inches) for low permeability
Procure and place sand backfill/cap	1,685	ton	\$	45	\$ 76,000	cap.
Procure and Install Geotextile	26,000	sy	\$	2.98	\$ 78,000	
Procure and place Impermeable Liner	26,000	sf	\$	2.00	\$ 52,000	Assume 6 inches of sand bedding for the impermeable liner. Sand volume
						included under sand cap line item. Assume geocomposite gas collection strips embedded in the sand layer with
Procure and place geocomposite gas collection layer	600	lf	\$	6.00	\$ 4.000	a spacing of 10 feet on center.
Procure and place armor stone for erosion protection	1,541	ton	\$	70	\$ 108,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	481	су	\$	78	\$ 38,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	7	day	\$	6,000	\$ 40,000	Based on an assumed average removal rate and cap production rate of
Monitoring			'	-,		1,000 cy/day.
Direct Capital Cost Subtotal		% of TDC	50%		\$ 1,112,000 \$ 556,000	
Indirect Capital Cost Total Capital Cost		76 UI IDC	30%	:	\$ 1.668.000	
SMA-6					\$ 1,008,000	
Sediment debris sweep and disposal	1.0	acre	\$	30,000	\$ 30,000	
Removal of docks and large obstructions	0	ls	\$		<u> </u>	For removal of large obstructions from cap areas.
Handling of water drained from excavated sediment	10	day	\$	10,000	\$ 100,000	
Sediment removal by mechanical dredging (barge-mounted)	8,148	су	\$	48	\$ 391,000	
Gravity dewatering on the barge	8,148	ls	\$	10	\$ 81,000	
Barge transport to rail facility	11,204	ton	\$	5	\$ 56,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	2,801	ton	\$	201	\$ 563,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	8,403	ton	\$	69	\$ 580,000	
Procure and place sand backfill/cap	5,704	ton	\$	45	\$ 257,000	Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	2,607	ton	\$	70		Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	815	су	\$	78	· · · · · · · · · · · · · · · · · · ·	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and	9	day	\$	6,000	\$ 55,000	Based on an assumed average removal rate and cap production rate of
Monitoring Direct Capital Cost Subtotal]	I			\$ 2,360,000	1,000 cy/day.
Indirect Capital Cost Subtotal		% of TDC	50%		\$ 2,360,000 \$ 1,180,000	
Total Capital Cost		5. 150	/0	!	\$ 3,540,000	
SMA-7					, 5,5-10,000	
Sediment debris sweep and disposal	2.0	acre	\$	30,000	\$ 59,000	
Removal of docks and large obstructions	0	Is	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	11,019	ton	\$	45	\$ 496,000	Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area.
· · · · · · · · · · · · · · · · · · ·					·	
Purchase and place AquagateTM with Powdered Activated Carbon	20,000	sf	\$	10	\$ 200,000	Placement of 4-inch layer of AC cap material (Aquagate-AC)
Purchase and place AquagateTM with Organoclay	46,800	sf	\$	25	\$ 1,170,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Amended cap media: Zero-Valent Iron	248,889	lb	\$	3		Assume application of 5% ZVI.
Prepare amended cap blend	1,778	су	\$			Mixing sand with 5% ZVI.
Amended Cap placement	1,778	су	\$	51	\$ 91,000	Placement of sand blended with 5% ZVI. Assume 12-inch thick amended cap.
Procure and place armor stone for erosion protection Construction Post Management Provides (PMPs) Maintenance and	2,519	ton	\$	70	•	Assume a thickness of 1 feet.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	15	day	\$	6,000	4 G7 (100)	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtotal	1	I			\$ 3,043,000	
Indirect Capital Cost		% of TDC	50%		\$ 1,521,500	
Total Capital Cost				:	\$ 4,564,500	
Total Gapital Gost					,001,000	



Description	Qua Number	Unit	Unit Co		ost Total Cost	Notes
Description SMA-8	Number	UIIIL	Unit C	JSL	Total Cost	Notes
Sediment debris sweep and disposal	0.6	acre	\$	30,000	\$ 18,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	3,306	ton	\$	45	\$ 149,000	Includes $f 1$ ft of sand bedding and $f 1$ ft sand cover for the amended cap area.
Purchase and place AquagateTM with Organoclay	25,500	sf	\$	25	\$ 638,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Procure and place armor stone for erosion protection	756	ton	\$	70	\$ 53,000	Assume a thickness of 1 foot
Construction Best Management Practices (BMPs) Maintenance and	4	day	\$	6,000	\$ 24,000	Based on an assumed average removal rate and cap production rate of
Monitoring Direct Capital Cost Subtotal					\$ 882,000	1,000 cy/day.
Indirect Capital Cost		% of TDC	50%		\$ 882,000 \$ 441,000	
Total Capital Cost		70 OI 1DO	3070		\$ 1,323,000	
SMA-9					, _,,,,	
Sediment debris sweep and disposal	2.8	acre	\$	30,000	\$ 85,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	16,074	ton	\$	45	\$ 723,000	Includes $f 1$ ft of sand bedding and $f 1$ ft sand cover for the amended cap area
Purchase and place AquagateTM with Organoclay	60,800	sf	\$	25	\$ 1,520,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Purchase and place AquagateTM with Powdered Activated Carbon	45,000	sf	\$	10	\$ 450,000	Placement of 4-inch layer of AC cap material (Aquagate-OC)
					·	, , , , , , , , , , , , , , , , , , , ,
Procure and place armor stone for erosion protection Construction Root Management Practices (PMPs) Maintenance and	3,674	ton	\$	70	\$ 257,000	Assume a thickness of 1 foot
Construction Best Management Practices (BMPs) Maintenance and Monitoring	20	day	\$	6,000	\$ 118,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtotal		<u>, I</u>			\$ 3,153,000	
Indirect Capital Cost		% of TDC	50%		\$ 1,576,500	
Total Capital Cost					\$ 4,729,500	
SMA-10 Sediment debris sween and disposal	0.6	acro	¢	30,000	\$ 17,000	T
Sediment debris sweep and disposal Removal of docks and large obstructions	0.6 1	acre Is	\$	30,000 100,000	\$ 17,000 \$ 100,000	For removal of large obstructions from cap areas.
Sediment removal by hydraulic dredging (Suction head)	92	су	\$	60	\$ 6,000	Diver assisted dredging around structures in the Marina
Dewatering of hydraulically dredged sediment	92	су	\$	14	\$ 1,000	
Sediment removal by mechanical dredging (barge-mounted)	827	су	\$	48	\$ 40,000	
Gravity dewatering on the barge	827	ls	\$	10	\$ 8,000	
Barge transport to rail facility	1,263	ton	\$	5	\$ 6,000	
Transport (truck/train) and dispose Soil at Subtitle C (hazardous waste) landfill	316	ton	\$	201	\$ 63,000	
Transport (truck/train) and dispose soil to Subtitle D landfill	947	ton	\$	69	\$ 65,000	
Procure and place sand backfill/cap	3,111	ton	\$	45	\$ 140,000	Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	711	ton	\$	70	\$ 50,000	Assume a thickness of 1 foot.
Construction Best Management Practices (BMPs) Maintenance and	5	day	\$	6,000	\$ 28,000	Based on an assumed average removal rate and cap production rate of
Monitoring Discont Control Control	Ĺ		, T			1,000 cy/day.
Direct Capital Cost Subtotal Indirect Capital Cost		% of TDC	50%		\$ 524,000 \$ 262,000	
Total Capital Cost		% 01 TDC	50%		\$ 786,000	
SMA-11					\$ 786,000	
Sediment debris sweep and disposal	6.2	acre	\$	30,000	\$ 185,000	
Removal of docks and large obstructions	0	ls	\$	100,000	\$ -	For removal of large obstructions from cap areas.
Procure and place sand backfill/cap	34,741	ton	\$	45	\$ 1,563,000	Assume 2 ft thick cap.
Procure and place armor stone for erosion protection	11,911	ton	\$	70	\$ 834,000	Assume a thickness of 2 feet.
Procure and place fish mix on armor rock to fill interstitial voids	4,963	су	\$	78	\$ 387,000	Assume a thickness of 6 inches.
Construction Best Management Practices (BMPs) Maintenance and Monitoring	52	day	\$	6,000	\$ 310,000	Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Direct Capital Cost Subtotal					\$ 3,279,000	
Indirect Capital Cost		% of TDC	50%		\$ 1,639,500	
Total Capital Cost					\$ 4,918,500	
SMA-12			1			
Sediment debris sweep and disposal	7.2 0	acre	\$	30,000	\$ 216,000 \$ -	For romoval of large obstructions from can areas
Removal of docks and large obstructions	_	Is	1	100,000	*	For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area
Procure and place sand backfill/cap	40,574	ton	\$	45	\$ 1,826,000	2-foot cap outside amendment areas.
Purchase and place AquagateTM with Organoclay	148,000	sf	\$	25	\$ 3,700,000	Placement of 4-inch layer of OC cap material (Aquagate-OC)
Procure and place 6-inch layer of pea gravel for armor	2,898	су	\$			
		+		27	\$ 78,000	Assume thin gravel across 50% of SMA-12
Procure and place armor stone for erosion protection	4,637	ton	\$	70	\$ 78,000 \$ 325,000	Assume 1-foot rock armor layer across 50% of SMA-12.
	4,637 48	ton			\$ 325,000	
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and	48		\$	70	\$ 325,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring	48		\$	70	\$ 325,000 \$ 289,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal	48	day	\$	70	\$ 325,000 \$ 289,000 \$ 6,434,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost	48	day	\$	70	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal	10.2	day % of TDC	\$ \$ 50%	70 6,000 30,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13	48	day % of TDC	\$ \$	70 6,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal	10.2	day % of TDC	\$ \$ 50%	70 6,000 30,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions	10.2	day % of TDC acre Is	\$ \$ 50%	70 6,000 30,000 100,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas.
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap	10.2 0 57,685 8,241	day % of TDC acre Is ton	\$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 2,596,000 \$ 223,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring	10.2 0 57,685 8,241 66	day % of TDC acre Is ton	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ - \$ 2,596,000 \$ 223,000 \$ 396,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal	10.2 0 57,685 8,241 66	day % of TDC acre Is ton cy day	\$ \$ 50% \$ \$ \$ \$ \$ \$	30,000 100,000 45	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost	10.2 0 57,685 8,241 66	day % of TDC acre Is ton	\$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 1,760,500	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost	10.2 0 57,685 8,241 66	day % of TDC acre Is ton cy day	\$ \$ 50% \$ \$ \$ \$ \$ \$	30,000 100,000 45	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-14	10.2 0 57,685 8,241 66	day % of TDC acre Is ton cy day % of TDC	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45 27 6,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 1,760,500 \$ 5,281,500	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost	10.2 0 57,685 8,241 66	day % of TDC acre Is ton cy day	\$ \$ 50% \$ \$ \$ \$ \$ \$	30,000 100,000 45	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 1,760,500 \$ 5,281,500	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-14 Sediment debris sweep and disposal	10.2 0 57,685 8,241 66	day % of TDC acre Is ton cy day % of TDC	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 30,000 100,000 45 27 6,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 1,760,500 \$ 5,281,500	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of 1,000 cy/day.
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-14 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place enhanced natural recovery (ENR) layer Construction Best Management Practices (BMPs) Maintenance and	10.2 0 57,685 8,241 66	day % of TDC acre Is ton cy day % of TDC acre Is cy	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 45 27 6,000 30,000 100,000 44	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 1,760,500 \$ 5,281,500 \$ 681,000 \$ 1,209,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-14 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place enhanced natural recovery (ENR) layer Construction Best Management Practices (BMPs) Maintenance and Monitoring	10.2 0 57,685 8,241 66 22.7 0 27,472 27	day % of TDC acre Is ton cy day % of TDC acre Is	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 100,000 45 27 6,000 30,000	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ 223,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 1,760,500 \$ 5,281,500 \$ 681,000 \$ 1,209,000 \$ 1,209,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume a thickness of 6 inches.
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-14 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place enhanced natural recovery (ENR) layer Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal	10.2 0 57,685 8,241 66 22.7 0 27,472 27	day % of TDC acre Is ton cy day % of TDC acre Is cy day	\$ 50% \$ \$ 50% \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 45 27 6,000 30,000 100,000 44	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 5,281,500 \$ 681,000 \$ 1,209,000 \$ 1,209,000 \$ 2,055,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
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Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-14 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place enhanced natural recovery (ENR) layer Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital	10.2 0 57,685 8,241 66 22.7 0 27,472 27	day % of TDC acre Is ton cy day % of TDC acre Is cy day	\$ 50% \$ \$ 50% \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 45 27 6,000 30,000 100,000 44	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 306,000 \$ 2,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 5,281,500 \$ 681,000 \$ 1,209,000 \$ 1,209,000 \$ 2,055,000	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap area 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of
Procure and place armor stone for erosion protection Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Total Capital Cost SMA-13 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place sand backfill/cap Procure and place 6-inch layer of pea gravel for armor Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost SMA-14 Sediment debris sweep and disposal Removal of docks and large obstructions Procure and place enhanced natural recovery (ENR) layer Construction Best Management Practices (BMPs) Maintenance and Monitoring Direct Capital Cost Subtotal Indirect Capital Cost Subtotal	10.2 0 57,685 8,241 66 22.7 0 27,472 27	day % of TDC acre Is ton cy day % of TDC acre Is cy day	\$ 50% \$ \$ 50% \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	30,000 45 27 6,000 30,000 100,000 44	\$ 325,000 \$ 289,000 \$ 6,434,000 \$ 3,217,000 \$ 9,651,000 \$ 20,596,000 \$ 223,000 \$ 396,000 \$ 3,521,000 \$ 1,760,500 \$ 5,281,500 \$ 681,000 \$ 1,209,000 \$ 1,209,000 \$ 1,027,500	Assume 1-foot rock armor layer across 50% of SMA-12. Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Includes 1 ft of sand bedding and 1 ft sand cover for the amended cap a 2-foot cap outside amendment areas. Assume thin gravel across 50% of SMA-12 Based on an assumed average removal rate and cap production rate of 1,000 cy/day. For removal of large obstructions from cap areas. Assume a thickness of 6 inches. Based on an assumed average removal rate and cap production rate of



	Qι	uantity		С	ost		
Description	Number	Unit	Unit Cost	t	Total	l Cost	Notes
Operation & Maintenance Costs							
Upland Long-term Groundwater Monitoring							
Entire Upland Area - Groundwater Monitoring of shoreline wells	s quarterly for	year 0, annua	ally for 10 y			by four 5-year	events
Groundwater sampling labor	30	well	\$	500		15,000	Quantity based on 30 shoreline wells including samples for field QA/QC.
Groundwater sample chemical analysis	30	well	\$	620		18,600	quantity success on our controller mone mone and complete for mone quy qui
Annual reporting	1	Is	\$	100,000		100,000	
Direct Subto	tal				\$	2,104,800	
Indirect 0&M Co	sts	% of TDC	17%		\$	357,816	
Undiscounted Subtotal (including Indirect Cos	sts)			·-	\$	2,463,000	
Net Present Value Subtotal (including Indirect Cos	sts)			•	\$	2,533,000	
Upland Cap Monitoring							
Cap monitoring, maintenance, and reporting - annual cost	1	Is	\$	30,000	\$	30,000	Assume annual monitoring for Years 1 to 10 followed by monitoring in Years 15, 20, 25 and 30.
Direct Subto	tal				\$	420,000	
Indirect 0&M Co	sts	% of TDC	17.0%		\$	71,400	
Undiscounted Subtotal (including Indirect Cos	sts)			:	\$	491,000	
Net Present Value Subtotal (including Indirect Cos	sts)			•	\$	507,000	
Sediment - Capping, ENR, MNR and ICs	•					,	
Sediment cap operation and maintenance monitoring and reporting	32	acre	\$	20,000	\$	640,000	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction. Includes monitoring and maintenance costs for amended cap and low-permeability cap.
ENR operation and maintenance monitoring and reporting	23	acre	\$	12,500	\$	283,750	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Periodic cap/ENR repair event		%		10%	\$	3,035,400	Assume repair in Year 5, and 10 after active remedy construction.
MNR operation and maintenance monitoring and reporting	0	acre	\$	10,000	\$	-	Assume monitoring in Year 1, 3, 5, 10, 15, 20, 25 and 30 after active remedy construction.
Institutional Controls - annual cost	1	ls	\$	25,000	\$	25,000	Assume annual costs for 30 years.
Direct Subto	tal				\$	14,210,800	
Indirect 0&M Co	sts	% of TDC	17%		\$	2,415,836	
Undiscounted Subtotal (including Indirect Cos	sts)				\$	16,627,000	
Net Present Value Subtotal (including Indirect Cos					\$	17,196,000	
Total Undiscounted 0&M Costs (30 Yea	•				\$	19,581,000	1
Total Net Present Value of O&M Costs (30 Yea	,					20,236,000	
	•					, -,	
Contingency (30 Percent of Total Co	st)				\$	21,676,000	
Total Cost of Alternative (Present Wor	th)				Ś	93.930.000	



Quantities Used for Detailed Cost Estimates Gas Works Park Site

Seattle, Washington

Alternative/Area ID Alternative 1 GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5	Area ft ²	Exc. Depth				Vegetated Cap							3 cullin	ent Cap				
Alternative 1 GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5		Exc. Deptn	For Valores	Cap/Geotextile		Tanasii Danth		Topsoil Volume +	Sand Cap Area	Sand Cap	END Area	Total Net Amended	AC- Amended	OC- Amended	ZVI- Amended	Low- Permeability	Sand Cap Thickness	Sand Cap Thickness
Alternative 1 GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5	π		Exc. Volume	Area ft ²	Depth	Topsoil Depth	SF	10% SF	(Conventional)	Area (Thick)	ENR Area	Cap Area	Cap Area	Cap Area	Cap Area	Cap Area ft ²	(Conventional)	(Thick)
GWMA-1, SMA-1, SMA-2 SMA-3 SMA-4 SMA-5		ft	су	π	ft	ft	су	су	π	π	π	π	ft²	π	π	π	ft	ft
SMA-3 SMA-4 SMA-5			1	T	1					T					T			
SMA-4 SMA-5	32,234	2 to 3	2,452	32,234	0.5	1.5	657	1,970	0	0	0	0	0	0	0	0	0	0
SMA-5	0	0	0	0	0	0	0	0	15,400	28,300	0	0	0	0	0	0	2	4
	0	0	0	0	0	0	0	0	8,700	3,700	0	0	0	0	0	0	2	4
10144.0	0	0	0	0	0	0	0	0	18,400	7,600	0	0	0	0	0	0	2	4
SMA-6	0	0	0	0	0	0	0	0	100,000	0	0	0	0	0	0	0	2	0
SMA-7	0	0	0	0	0	0	0	0	37,000	48,000	0	0	0	0	0	0	2	4
SMA-8	0	0	0	0	0	0	0	0	0	25,500	0	0	0	0	0	0	2	4
SMA-9	0	0	0	0	0	0	0	0	0	124,000	0	0	0	0	0	0	2	4
SMA-10	0	0	0	0	0	0	0	0	24,000	0	0	0	0	0	0	0	2	0
SMA-11	0	0	0	0	0	0	0	0	268,000	0	0	0	0	0	0	0	2	0
SMA-12 SMA-13	0	0	0	0	0	0	0	0	165,000 0	148,000	0 445,000	0	0	0	0	0	0	0
	U	U	U	U	U	U	U	U	U	0	440,000	U	U	U	U	U	U	
Alternative 2	20.024	2+- 2	0.450	20.024	0.5	4 -	657	1.070	0			0	0	^			0	
GWMA-1, SMA-1, SMA-2	32,234	2 to 3	2,452	32,234	0.5	1.5	657	1,970	0	0	0	0	0	0 15 600	0	0	0	0
SMA-3 SMA-4	0	0	0	0	0	0	0	0	15,400	0	0	28,300	28,300	15,600	9,600	0	2	0
SMA-5	0	0	0	0	0	0	0	0	3,000	0	0	9,000	9,000	4,000	0	0	2	0
SMA-6	0	0	0	0	0	0	0	0	0	0	0	26,000	26,000	4,000	0	0	0	0
SMA-7	0	0	0	0	0	0	0	0	100,000	0	0	0	0	0	0	0	2	0
SMA-8	0	0	0	0	0	0	0	0	37,000	48,000	0	0	0	0	0	0	2	4
SMA-9	0	0	0	0	0	0	0	0	0	25,500	0	0	0	0	0	0	0	4
SMA-10	0	0	0	0	0	0	0	0	0	124,000	0	0	0	0	0	0	0	4
SMA-10	0	0	0	0	0	0	0	0	24,000	0	0	0	0	0	0	0	2	0
SMA-12			0				0	0	268,000	0	0		0	*	0	0	2	0
SMA-13	0	0	0	0	0	0	0	0	165,000 0	148,000 0	0 445,000	0	0	0	0	0	0	0
Alternative 3	U	U	U	U	U	U	U	0	0	U	445,000	U	U	U	U	U	U	
-	32,234	2+2	0.450	32,234	٥۶	4 5	657	1.070	0	0	0	0	0	0	0	0	0	0
GWMA-1, SMA-1, SMA-2 SMA-3	0	2 to 3	2,452		0.5 0	1.5 0		1,970	15,400	0		0		0	0	28,300	2	0
SMA-4	-	0	0	0	0		0	0	3,000	0	0	0	0	0	0	9,000	2	0
SMA-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,000	1	0
SMA-6	0	0	0	0	0	0	0	0	100.000	0	0	0	0	0	0	0	2	0
SMA-7	0	0	0	0	0	0	0	0	13,000	0	0	72,000	20,000	46,800	48,000	0	2	0
SMA-8	0	0	0	0	0	0	0	0	0	0	0	25,500	0	25,500	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0	37,000	0	0	87,000	45,000	60,800	0	0	2	0
SMA-10	0	0	0	0	0	0	0	0	24,000	0	0	0	45,000	0	0	0	2	0
SMA-11	0	0	0	0	0	0	0	0	268,000	0	0	0	0	0	0	0	2	0
SMA-12	0	0	0	0	0	0	0	0	165,000	0	0	148,000	0	148,000	0	0	2	0
SMA-13	0	0	0	0	0	0	0	0	0	0	445,000	0	0	0	0	0	0	0
Alternative 4	V	ű	ı	ı	Ŭ	Ŭ	Ŭ	<u> </u>	Ŭ .	Ŭ	1 10,000	v	v		Ŭ	ı	Ŭ.	
GWMA-1, SMA-1, SMA-2	32,234	4	4,775	32,234	0.5	1.5	657	1,970	0	0	0	0				0	0	0
SMA-3	0	0	0	0	0.5	0	0	0	15,400	0	0	28,300	28,300	15,600	9,600	0	2	0
SMA-4	0	0	0	0	0	0	0	0	8,700	0	0	0	0	0	0	3,700	2	0
SMA-5	0	0	0	0	0	0	0	0	18,400	0	0	0	0	0	0	7,600	2	0
SMA-6	0	0	0	0	0	0	0	0	100,000	0	0	0	0	0	0	0	2	0
SMA-7	0	0	0	0	0	0	0	0	37,000	48,000	0	0	0	0	0	0	2	4
SMA-8	0	0	0	0	0	0	0	0	0	25,500	0	0	0	0	0	0	0	4
SMA-9	0	0	0	0	0	0	0	0	0	25,500 86,000	0	38,000	13,000	38,000	0	0	0	4
SMA-10	0	0	0	0	0	0	0	0	24,000	0	0	0	0	0	0	0	2	0



		Excavation	1			Vegetated Cap							Sedim	ent Cap				
	Area	Exc. Depth	Exc. Volume	Cap/Geotextile Area	Drainage Rock Depth	Topsoil Depth	Drainage Rock Volume + 10% SF	Topsoil Volume +	Sand Cap Area (Conventional)	Sand Cap Area (Thick)	ENR Area	Total Net Amended Cap Area	AC- Amended Cap Area	OC- Amended Cap Area	ZVI- Amended Cap Area	Low- Permeability Cap Area	Sand Cap Thickness (Conventional)	Sand Cap Thickness (Thick)
Alternative/Area ID	ft ²	ft	су	ft ²	ft	ft	су	су	ft ²	ft ²	ft ²	ft ²	ft ²	ft ²	ft ²	ft ²	ft	ft
SMA-11	0	0	0	0	0	0	0	0	268,000	0	0	0	0	0	0	0	2	0
SMA-12	0	0	0	0	0	0	0	0	165,000	148,000	0	0	0	0	0	0	2	4
SMA-13	0	0	0	0	0	0	0	0	0	0	445,000	0	0	0	0	0	0	0
Alternative 5	•	•	•	•			•		•	•	•	•	•	•	•	•	•	*
GWMA-1, SMA-1, SMA-2	32,234	4	4,775	32,234	0.5	1.5	657	1,970	0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0	0	0	0	0	0	15,400	0	0	0	0	0	0	28,300	2	0
SMA-4	0	0	0	0	0	0	0	0	8,700	0	0	0	0	0	0	3,700	2	0
SMA-5	0	0	0	0	0	0	0	0	18,400	0	0	0	0	0	0	7,600	2	0
SMA-6	0	0	0	0	0	0	0	0	100,000	0	0	0	0	0	0	0	2	0
SMA-7	0	0	0	0	0	0	0	0	13,000	0	0	72,000	20,000	46,800	48,000	0	2	0
SMA-8	0	0	0	0	0	0	0	0	0	0	0	25,500	0	25,500	0	0	2	0
SMA-9	0	0	0	0	0	0	0	0	0	86,000	0	38,000	13,000	38,000	0	0	0	4
SMA-10	0	0	0	0	0	0	0	0	24,000	0	0	0	0	0	0	0	2	0
SMA-11	0	0	0	0	0	0	0	0	268,000	0	0	0	0	0	0	0	2	0
SMA-12	0	0	0	0	0	0	0	0	165,000	148,000	0	0	0	0	0	0	2	4
SMA-13	0	0	0	0	0	0	0	0	0	0	445,000	0	0	0	0	0	0	0
Alternative 6			1	1		-	1	-			, , , , , , , , , , , , , , , , , , , ,					1		
GWMA-1, SMA-1, SMA-2	32,234	4	4,775	32,234	0.5	1.5	657	1,970	0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0	0	0	0	0	0	15,400	0	0	0	0	0	0	28,300	2	0
SMA-4	0	0	0	0	0	0	0	0	3,000	0	0	0	0	0	0	9,000	2	0
SMA-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,000	2	0
SMA-6	0	0	0	0	0	0	0	0	100,000	0	0	0	0	0	0	0	2	0
SMA-7	0	0	0	0	0	0	0	0	13,000	0	0	72,000	20,000	46,800	48,000	0	2	0
SMA-8	0	0	0	0	0	0	0	0	0	25,500	0	0	0	0	0	0	0	4
SMA-9	0	0	0	0	0	0	0	0	37,000	0	0	87,000	45,000	60,800	0	0	2	0
SMA-10	0	0	0	0	0	0	0	0	24,000	0	0	0	0	00,800	0	0	2	0
SMA-11	0	0	0	0	0	0	0	0	268,000	0	0	0	0	0	0	0	2	0
SMA-12	0	0	0	0	0	0	0	0	165,000	148,000	0	0	0	0	0	0	2	4
SMA-13	0	0	0	0	0	0	0	0	0	0	445,000	0	0	0	0	0	0	0
Alternative 7	ŭ	ŭ	ŭ	Ů	Ü		Ü	- U	Ü	Ü	110,000	Ü	Ü	Ü	ŭ	ŭ	Ü	
GWMA-1. SMA-1. SMA-2	32,234	4	4,775	32,234	0.5	1.5	657	1,970	0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0	0	0.5	0	0	0	15,400	0	0	0	0	0	0	28,300	2	0
SMA-4	0	0	0	0	0	0	0	0	3,000	0	0	0	0	0	0	9,000	2	0
SMA-5	0	0	0	0	0	0	0				0	0	0	0	0	26,000		0
SMA-6	0	0	0	0	0	0	0	0	44,000	0	0	0	0	0	0	0	2	0
SMA-7	0	0	0	-	0	0	0	0	13,000		0	72,000	20,000	46,800	48,000	0	2	0
SMA-8		0	0	0				0	,	0		25,500					0	0
SMA-9	0	0	0	0	0	0	0	0	0 37,000	0	0		0 45,000	25,500	0	0		0
SMA-10	0	0	0	0		0		0	24,000	0	0	87,000 0	45,000	60,800		0	2	0
SMA-11	0	0			0	0	0	0	24,000	0		0	0	0	0	0	2	
SMA-12	0	0	0	0	0	0	0	0	165,000	0	0	148,000	0	148,000	0	0	2	0
SMA-13	0	0	0	0	0	0	0	0	· · · · · · · · · · · · · · · · · · ·	0	445,000		0	0	0	0		0
SMA-14	0	0	0	0	0	0	0	0	0	0	445,000	0	0	0	0	0	0	0
	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Alternative 8	22.22.4		4 775	20.004	0.5	4.5	057	4.070		^		_	^	_			1 0	
GWMA-1, SMA-1, SMA-2	32,234	4	4,775	32,234	0.5	1.5	657	1,970	0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0	0	0	0	0	0	15,400	0	0	0	0	0	0	28,300	2	0
SMA-4	0	0	0	0	0	0	0	0	3,000	0	0	0	0	0	0	9,000	2	0
SMA-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,000	2	0
SMA-6	0	0	0	0	0	0	0	0	44,000	0	0	0	0	0	0	0	2	0
SMA-7	0	0	0	0	0	0	0	0	13,000	0	0	72,000	20,000	46,800	48,000	0	2	0
SMA-8	0	0	0	0	0	0	0	0	0	0	0	25,500	0	25,500	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0	37,000	0	0	87,000	45,000	60,800	0	0	2	0
SMA-10	0	0	0	0	0	0	0	0	24,000	0	0	0	0	0	0	0	2	0
SMA-11	0	0	0	0	0	0	0	0	268,000	0	0	0	0	0	0	0	2	0
SMA-12	0	0	0	0	0	0	0	0	165,000	0	0	148,000	0	148,000	0	0	2	0



		Excavation	1			Vegetated Cap							Sedim	ent Cap				
				0 (0 1 1")	But an But	<u> </u>	Drainage Rock		0101	010		Total Net	AC-	OC-	ZVI-	Low-	Sand Cap	Sand Cap
	_			Cap/Geotextile	_			•	Sand Cap Area	•		Amended	Amended			Permeability		Thickness
	Area	Exc. Depth	Exc. Volume	Area	Depth	Topsoil Depth	SF	10% SF	(Conventional)	Area (Thick)	ENR Area	Cap Area	(Conventional)	(Thick)				
Alternative/Area ID	ft ²	ft	су	ft²	ft	ft	су	су	ft ²	ft	ft							
SMA-13	0	0	0	0	0	0	0	0	445,000	0	0	0	0	0	0	0	2	0
SMA-14	0	0	0	0	0	0	0	0	0	0	989,000	0	0	0	0	0	0	0

1. Areas and volumes for alternatives based on polygons and cross sections developed in GIS.



					Sedimen	•					Sediment Exc	avation/Dredge	
	ENR Thickness	Amended Cap Thickness	Fish Mix/Erosion Protection Layer Thickness	Rock Armor Thickness	Sand Cap Volume (Conventional) +25% Volume Cont	Sand Cap Volume (Thick) +25% Volume Cont	ENR Material Volume +50% Volume Cont	Fish Mix/Erosion Protection Volume	Rock Armor Tonnage	Land-based Excavation Area	Mechanical Dredge Area	Hydraulic Dredge Area	Land-based Excavation Depth
Alternative/Area ID	ft	ft	ft	ft	су	су	су	су	ton	ft ²	ft ²	ft ²	ft
Alternative 1	•				•								•
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0.5	2.0	1,426	5,241	0	809	2,590	44,000	0	0	3.0
SMA-4	0	0	0.5	2.0	806	685	0	230	735	12,400	0	0	3.0
SMA-5	0	0	0.5	2.0	1,704	1,407	0	481	1,541	0	23,400	2,600	0
SMA-6	0	0	0.5	2.0	9,259	0	0	1,852	5,926	0	0	0	0
SMA-7	0	0	0.0	1.0	3,426	8,889	0	0	2,519	0	0	0	0
SMA-8	0	0	0.0	1.0	0	4,722	0	0	756	0	0	0	0
SMA-9	0	0	0.0	1.0	0	22,963	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0	1.0	2,222	0	0	0	711	0	5,580	620	0
SMA-11	0	0	0.5	1.5	24,815	0	0	4,963	11,911	0	0	0	0
SMA-12	0	0	0.5	1.0	15,278	27,407	0	2,898	4,637	0	0	0	0
SMA-13	0.5	0	0.0	0.0	0	0	12,361	0	0	0	0	0	0
Alternative 2													
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3	0	1	0.5	2.0	2,736	0	0	809	2,590	44,000	0	0	3.0
SMA-4	0	1	0.5	2.0	694	0	0	222	711	12,400	0	0	3.0
SMA-5	0	1	0.5	2.0	1,204	0	0	481	1,541	0	23,400	2,600	0
SMA-6	0	0	0.5	2.0	9,259	0	0	1,852	5,926	0	0	0	0
SMA-7	0	0	0.0	1.0	3,426	8,889	0	0	2,519	0	0	0	0
SMA-8	0	0	0.0	1.0	0	4,722	0	0	756	0	0	0	0
SMA-9	0	0	0.0	1.0	0	22,963	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0	1.0	2,222	0	0	0	711	0	5,580	620	0
SMA-11	0	0	0.5	1.5	24,815	0	0	4,963	11,911	0	0	0	0
SMA-12	0	0	0.5	1.0	15,278	27,407	0	2,898	4,637	0	0	0	0
SMA-13	0.5	0	0.0	0.0	0	0	12,361	0	0	0	0	0	0
Alternative 3													
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0.5	2.0	2,736	0	0	809	2,590	44,000	0	0	3.0
SMA-4	0	0	0.5	2.0	694	0	0	222	711	12,400	0	0	3.0
SMA-5	0	0	0.5	2.0	1,204	0	0	481	1,541	0	23,400	2,600	0
SMA-6	0	0	0.5	2.0	9,259	0	0	1,852	5,926	0	0	0	0
SMA-7	0	2	0.0	1.0	7,870	0	0	0	2,519	0	0	0	0
SMA-8	0	2	0.0	1.0	2,361	0	0	0	756	0	0	0	0
SMA-9	0	2	0.0	1.0	11,481	0	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0	1.0	2,222	0	0	0	711	0	5,580	620	0
SMA-11	0	0	0.5	1.5	24,815	0	0	4,963	11,911	0	0	0	0
SMA-12	0	2	0.5	1.0	28,981	0	0	2,898	4,637	0	0	0	0
SMA-13	0.5	0	0.0	0.0	0	0	12,361	0	0	0	0	0	0
Alternative 4													
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3	0	1	0.5	2.0	2,736	0	0	809	2,590	44,000	0	0	6.0
SMA-4	0	0	0.5	2.0	977	0	0	230	735	12,400	0	0	6.0
SMA-5	0	0	0.5	2.0	2,056	0	0	481	1,541	0	23,400	2,600	0
SMA-6	0	0	0.5	2.0	9,259	0	0	1,852	5,926	0	0	0	0
SMA-7	0	0	0.5	1.0	3,426	8,889	0	1,574	2,519	0	0	0	0
SMA-8	0	0	0.0	1.0	0	4,722	0	0	756	0	0	0	0
SMA-9	0	2	0.0	1.0	3,519	15,926	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0	1.0	2,222	0	0	0	711	0	5,580	620	0



					Sedimen	t Cap					Sediment Exc	avation/Dredge	
	ENR Thickness	Amended Cap Thickness	Fish Mix/Erosion Protection Layer Thickness	Rock Armor Thickness	Sand Cap Volume	Sand Cap Volume	ENR Material Volume +50% Volume Cont	Fish Mix/Erosion Protection Volume	Rock Armor Tonnage	Land-based Excavation Area	Mechanical Dredge Area	Hydraulic Dredge Area	Land-based Excavation Depth
Alternative/Area ID	ft	ft	ft	ft	су	су	су	су	ton	ft ²	ft ²	ft ²	ft
SMA-11	0	0	0.5	1.5	24,815	0	0	4,963	11,911	0	0	0	0
SMA-12	0	0	0.5	1.0	15,278	27,407	0	2,898	4,637	0	0	0	0
SMA-13	0.5	0	0.0	0.0	0	0	12,361	0	0	0	0	0	0
Alternative 5	•		•		•								
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0.5	2.0	2,736	0	0	809	2,590	44,000	0	0	6.0
SMA-4	0	0	0.5	2.0	977	0	0	230	735	12,400	0	0	6.0
SMA-5	0	0	0.5	2.0	2,056	0	0	481	1,541	0	23,400	2,600	0
SMA-6	0	0	0.5	2.0	9,259	0	0	1,852	5,926	0	0	0	0
SMA-7	0	2	0.0	1.0	7,870	0	0	0	2,519	0	0	0	0
SMA-8	0	2	0.0	1.0	2,361	0	0	0	756	0	0	0	0
SMA-9	0	2	0.0	1.0	3,519	15,926	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0	1.0	2,222	0	0	0	711	0	5,580	620	0
SMA-11	0	0	0.5	1.5	24,815	0	0	4,963	11,911	0	0	0	0
SMA-12	0	0	0.5	1.0	15,278	27,407	0	2,898	4,637	0	0	0	0
SMA-13	0.5	0	0.0	0.0	0	0	12,361	0	0	0	0	0	0
Alternative 6	1 ,				ı		,	•	1	-	<u>-</u>		<u> </u>
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0.5	2.0	2,736	0	0	809	2,590	44,000	0	0	6.0
SMA-4	0	0	0.5	2.0	694	0	0	222	711	12,400	0	0	6.0
SMA-5	0	0	0.5	2.0	1,204	0	0	481	1,541	0	23,400	2,600	0
SMA-6	0	0	0.5	2.0	9,259	0	0	1,852	5,926	0	0	0	0
SMA-7	0	2	0.0	1.0	7,870	0	0	0	2,519	0	0	0	0
SMA-8	0	0	0.0	1.0	0	4,722	0	0	756	0	0	0	0
SMA-9	0	2	0.0	1.0	11,481	0	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0	1.0	2,222	0	0	0	711	0	5,580	620	0
SMA-11	0	0	0.5	1.5	24,815	0	0	4,963	11,911	0	0	0	0
SMA-12	0	0	0.5	1.0	15,278	27,407	0	2,898	4,637	0	0	0	0
SMA-13	0.5	0	0.0	0.0	0	0	12,361	0	0	0	0	0	0
Alternative 7	0.5	Ü	0.0	0.0	U	v	12,501	Ü	Ŭ			Ŭ	v
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3	0	0	0.5	2.0	2,736	0	0	809	2,590	44,000	0	0	6.0
SMA-4	0	0	0.5	2.0	694	0	0	222	711	12,400	0	0	6.0
SMA-5	0		0.5		1,204		_		1,541	•	23,400	2,600	•
SMA-6	0	0	0.5	2.0	4,074	0	0	481 815	2,607	0	44,000	0	0.0
SMA-7	0	2			7,870	0	0			0		0	
SMA-8	0	2	0.0	1.0	2,361	0	0	0	2,519 756	0	0	0	0
SMA-9	0	2	0.0	1.0	2,361	0	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0		· ·		0	0	711	0		620	0
SMA-11	0			1.0	2,222 24,815	0					5,580		
SMA-11	0	0 2	0.5	1.5		0	0	4,963 2,898	11,911	0	0	0	0
SMA-12	1	0	0.5 0.5	0.0	28,981	0	12,361	2,898 8,241	4,637 0	0	0	0	0
SMA-14	0.0	0	0.5	0.0	0	0	0	8,241	0	0	0	0	0
	0.0	U	0.0	0.0	U	U	U	U	U	U	U	U	U
Alternative 8		^		0.0	1 ^	0		^		^	^	^	^
GWMA-1, SMA-1, SMA-2	0	0	0.0	0.0	0	0	0	0	0	0	0	0	0
SMA-3 SMA-4	0	0	0.5	2.0	2,736	0	0	809	2,590	44,000	0	0	6.0
	0	0	0.5	2.0	694	0	0	222	711	12,400	0	0	6.0
SMA-5	0	0	0.5	2.0	1,204	0	0	481	1,541	0	23,400	2,600	0
SMA-6	0	0	0.5	2.0	4,074	0	0	815	2,607	0	44,000	0	0.0
SMA-7	0	2	0.0	1.0	7,870	0	0	0	2,519	0	0	0	0
SMA-8	0	2	0.0	1.0	2,361	0	0	0	756	0	0	0	0
SMA-9	0	2	0.0	1.0	11,481	0	0	0	3,674	0	0	0	0
SMA-10	0	0	0.0	1.0	2,222	0	0	0	711	0	5,580	620	0
SMA-11	0	0	0.5	1.5	24,815	0	0	4,963	11,911	0	0	0	0
SMA-12	0	2	0.5	1.0	28,981	0	0	2,898	4,637	0	0	0	0



					Sedimen	t Cap					Sediment Exca	avation/Dredge	
			Fish Mix/Erosion		Sand Cap Volume	Sand Cap Volume							
	ENR	Amended Cap	Protection Layer	Rock Armor	(Conventional) +25%	(Thick) +25% Volume	ENR Material Volume	Fish Mix/Erosion		Land-based	Mechanical Dredge	Hydraulic Dredge	Land-based
	Thickness	Thickness	Thickness	Thickness	Volume Cont	Cont	+50% Volume Cont	Protection Volume	Rock Armor Tonnage	Excavation Area	Area	Area	Excavation Depth
Alternative/Area ID	ft	ft	ft	ft	су	су	су	су	ton	ft ²	ft ²	ft²	ft
SMA-13	0	0	0.5	0.0	41,204	0	0	8,241	0	0	0	0	0
SMA-14	0.5	0	0.0	0.0	0	0	27,472	0	0	0	0	0	0



		Sedim	nent Excavation/Dredge				portation and osal	ISCF
	Mechanical Dredge Depth	Hydraulic Dredge Depth	Land-based Excavation Volume	Hydraulic Dredge Volume	Mechanical Dredge Volume	Subtitle C Landfill +10% BF	Subtitle D Landfill +10% BF	Area
Alternative/Area ID	ft	ft	су	су	су	tons	tons	ft ²
Alternative 1				,	-			
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	3,776	0	7,500
SMA-3	0.0	0	4,889	0	0	1,681	5,042	0
SMA-4	0.0	0	1,378	0	0	474	1,421	0
SMA-5	3.0	3.0	0	289	2,600	993	2,979	0
SMA-6	0	0	0	0	0	0	0	0
SMA-7	0	0	0	0	0	0	0	0
SMA-8	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	3.0	3.0	0	69	620	237	710	0
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0
SMA-13	0	0	0	0	0	0	0	0
Alternative 2	•						l I	
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	3,776	0	7,500
SMA-3	0.0	0	4,889	0	0	1,681	5,042	0
SMA-4	0.0	0	1,378	0	0	474	1,421	0
SMA-5	3.0	3.0	0	289	2,600	993	2,979	0
SMA-6	0	0	0	0	0	0	0	0
SMA-7	0	0	0	0	0	0	0	0
SMA-8	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	3.0	3.0	0	69	620	237	710	0
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0
SMA-13	0	0	0	0	0	0	0	0
Alternative 3	<u> </u>							
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	3,776	0	7,500
SMA-3	0.0	0	4,889	0	0	1,681	5,042	0
SMA-4	0.0	0	1,378	0	0	474	1,421	0
SMA-5	3.0	3.0	0	289	2,600	993	2,979	0
SMA-6	0	0	0	0	0	0	0	0
SMA-7	0	0	0	0	0	0	0	0
SMA-8	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	3.0	3.0	0	69	620	237	710	0
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0
SMA-13	0	0	0	0	0	0	0	0
Alternative 4	•				•			
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	7,354	0	7,500
SMA-3	0.0	0	9,778	0	0	3,361	10,083	0
SMA-4	0.0	0	2,756	0	0	947	2,842	0
SMA-5	3.0	3.0	0	289	2,600	993	2,979	0
SMA-6	0	0	0	0	0	0	0	0
SMA-7	0	0	0	0	0	0	0	0
SMA-8	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	3.0	3.0	0	69	620	237	710	0



		Sedim	nent Excavation/Dredge	,			portation and osal	ISCF
	Mechanical Dredge Depth	Hydraulic Dredge Depth	Land-based Excavation Volume	Hydraulic Dredge Volume	Mechanical Dredge Volume	Subtitle C Landfill +10% BF	Subtitle D Landfill +10% BF	Area
Alternative/Area ID	ft	ft	су	су	су	tons	tons	ft ²
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0
SMA-13	0	0	0	0	0	0	0	0
Alternative 5								
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	7,354	0	7,500
SMA-3	0.0	0	9,778	0	0	3,361	10,083	0
SMA-4	0.0	0	2,756	0	0	947	2,842	0
SMA-5	3.0	3.0	0	289	2,600	993	2,979	0
SMA-6	0	0	0	0	0	0	0	0
SMA-7	0	0	0	0	0	0	0	0
SMA-8	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	3.0	3.0	0	69	620	237	710	0
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0
SMA-13	0	0	0	0	0	0	0	0
Alternative 6	, and the second	<u> </u>	, , , , , , , , , , , , , , , , , , ,	·	<u> </u>	<u> </u>	Ţ	
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	7,354	0	7,500
SMA-3	0.0	0	9,778	0	0	3,361	10,083	0
SMA-4	0.0	0	2,756	0	0	947	2,842	0
SMA-5	3.0	3.0	0	289		993	2,979	0
SMA-6		0	0	0	2,600		0	
SMA-7	0				0	0		0
SMA-8	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	3.0	3.0	0	69	620	237	710	0
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0
SMA-13	U	0	U	U	U	U	U	U
Alternative 7			1 ^		1 .	7.054		7.500
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	7,354	0	7,500
SMA-3	0.0	0	9,778	0	0	3,361	10,083	0
SMA-4	0.0	0	2,756	0	0	947	2,842	0
SMA-5	3.0	3.0	0	289	2,600	993	2,979	0
SMA-6	5.0	0	0	0	8,148	2,801	8,403	0
SMA-7	0	0	0	0	0	0	0	0
SMA-8	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	4.0	4.0	0	92	827	316	947	0
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0
SMA-13	0	0	0	0	0	0	0	0
SMA-14	0	0	0	0	0	0	0	0
Alternative 8								
GWMA-1, SMA-1, SMA-2	0	0	0	0	0	7,354	0	7,500
SMA-3	0.0	0	9,778	0	0	3,361	10,083	0
SMA-4	0.0	0	2,756	0	0	947	2,842	0
SMA-5	3.0	3.0	0	289	2,600	993	2,979	0
SMA-6	5.0	0	0	0	8,148	2,801	8,403	0
SMA-7	0	0	0	0	0	0	0	0
SMA-8	0	0	0	0	0	0	0	0
SMA-9	0	0	0	0	0	0	0	0
SMA-10	4.0	4.0	0	92	827	316	947	0
SMA-11	0	0	0	0	0	0	0	0
SMA-12	0	0	0	0	0	0	0	0



		Sedim	ent Excavation/Dredge	,			portation and osal	ISCF
			, <u>,</u>			Subtitle C	Subtitle D	
	Mechanical Dredge	Hydraulic Dredge	Land-based	Hydraulic Dredge	Mechanical	Landfill +10%	Landfill +10%	
	Depth	Depth	Excavation Volume	Volume	Dredge Volume	BF	BF	Area
Alternative/Area ID	ft	ft	су	су	су	tons	tons	ft ²
SMA-13	0	0	0	0	0	0	0	0
SMA-14	0	0	0	0	0	0	0	0

