

Section 9 Description of Alternatives

This section presents EPA's alternatives for achieving its objectives at the Butte Priority Soils OU. It briefly describes the alternatives studied, their interaction with past remedial actions, the estimated costs for each alternative, their common elements, and how they differ from one another.

This section provides a detailed description of each alternative so that Section 10 (The Comparative Analysis of Alternatives) can focus on the differences and similarities among the alternatives with respect to the nine NCP criteria. As an introduction, this section briefly describes the development of the alternatives and how previous response actions were integrated into the FS. Due to the complex nature of this OU, remedial alternatives were developed for the various media throughout the entire OU and a separate set of alternatives were developed to address the specific issues of the MSD area. To promote a better understanding of each alternative, the descriptions provided in this section are separated into 1) Site-Wide alternatives and 2) Metro Storm Drain alternatives. The comparative analysis of alternatives in Section 10 integrates these sets of alternatives into "comprehensive" alternatives.

9.1 Development of Alternatives

EPA screened potential cleanup technologies as the first phase of the FS. The screening process identified all the technologies that were potentially feasible for treating or remediating inorganic contaminants in groundwater, surface water, sediment, and soil/mine waste. It then evaluated these technologies for their effectiveness and implementability.

The FS report considered a wide range of media-specific remedial alternatives and special geographic and land use components within the OU. Each component identified for consideration in the FS contained its own unique set of characteristics, including factors such as proximity to surface water bodies or groundwater, potential to impact storm water quality, ground and surface water interaction, potential for development or other uses, or historical significance.

Remedial alternatives for the Metro Storm Drain area were evaluated in the site-wide FS and also in the *Focused Feasibility Study, Metro Storm Drain* (FFS) which provided a greater degree of evaluation and alternative development. The FFS presented additional analysis and interpretation of data resulting from site investigation activities performed by EPA and the Montana Bureau of Mines and Geology after the site-wide FS was drafted.

9.2 Integration of Past Response Actions

CERCLA, or the Superfund law, requires past response actions to be designed and constructed in a manner consistent with a final remedy if possible and requires EPA to ensure an orderly transition from removal action to remedial action. Before deciding if past response actions would be compatible with the final remedy, EPA

evaluated whether the past response actions were consistent with the cleanup objectives and ARARs. That assessment was published in the Response Action Summary Document (October 2, 2003). The assessment concluded that all but three past removal actions complied with ARARs and were consistent with the cleanup objectives established for the final remedy.

Based on the Response Action Summary Document and the administrative record for past response actions, EPA granted a conditional, limited no further action status to all past response action sites, except the Colorado Smelter removal site, Lower Railroad Yard Site 1, and the LAO removal site. However, for sites granted the no further action status, EPA, in consultation with the State, may still select additional actions in the final cleanup plan to address protectiveness or ARAR compliance issues at these sites. These potential additional actions include, but are not limited to: specific management practices, storm water controls, groundwater protection measures, and cap modifications.

EPA has also developed the Butte Reclamation Evaluation System to ensure that reclaimed areas will remain stable and protective. This system is a site-specific tool to evaluate the stability, integrity, and degree of human and environmental protectiveness afforded by EPA-sanctioned response actions initiated on lands impacted by mining within the OU. This system will evaluate, through routine inspections, the:

- Condition and diversity of vegetative cover
- Presence of erosion
- Condition of site edges
- Presence of exposed waste material
- Presence of bulk soil failure or mass instability
- Presence of barren areas or gullies

This system includes corrective action triggers and a database to track trends and schedule maintenance and future field evaluations. The final BRES is attached as Appendix B.

Along with developing findings under the BRES, an operation and maintenance plan will be developed for reclaimed areas. This program will ensure long-term effectiveness and permanence for these areas. Institutional Controls (ICs) are necessary to protect the remedy and human health, and are therefore a component of every alternative, including the preferred alternative. Further details on ICs are provided in subsequent sections of this ROD.

Detailed operation and maintenance of sites where past response actions have occurred is required by the Selected Remedy. Past response actions are also subject to

five-year reviews to ensure that the cleanup actions remain protective. The Butte Reclamation Evaluation System program will ensure long-term effectiveness and permanence for all capped wastes and reclaimed areas.

9.3 Remedial Alternatives

For simplicity, the descriptions of alternatives in this section are separated into two sets: Site-Wide and Metro Storm Drain remedial alternatives. Following the listing of the major components of each alternative, commonalities and differences of the alternatives are presented. The detailed comparison of the alternatives in Section 10 integrates the Metro Storm Drain alternatives with the Site-Wide alternatives; these combined alternatives are then referred to as “comprehensive” alternatives.

Site-Wide Alternatives

The Site-Wide alternatives developed for the OU are:

- Alternative 1 – No Further Action.
- Alternative 2 – Engineered covers/Partial Removal for Solid Media, Treatment of LAO Groundwater, Surface Water best management practices (BMPs), ICs, and Monitoring.
- Alternative 3 – Engineered covers/Partial Removal/Limited Treatment for Solid Media, Groundwater Collection and Redirection to the Berkeley Pit, Surface Water BMPs, ICs, and Monitoring.
- Alternative 4 – Engineered covers/Partial Removal/Limited Treatment for Solid Media, Groundwater Collection and Lime Treatment, Surface Water BMPs, ICs, and Monitoring.
- Alternative 5 – Engineered covers/Partial Removal/Limited Treatment for Solid Media, Groundwater Source Material Partial Removal/Collection and Lime Treatment, Surface Water BMPs, ICs, and Monitoring.
- Alternative 6 – Source Material Removal, Groundwater Source Material Removal/Collection and Lime Treatment, Surface Water BMPs, ICs, and Monitoring.

Metro Storm Drain Area Alternatives

These alternatives were developed in the *Focused Feasibility Study, Metro Storm Drain* to augment the Site-Wide alternatives. Each consists of water treatment and/or waste removal options. Groundwater collection and treatment in this area of the site is intended to prevent discharge of contaminated base flow to Silver Bow Creek. Source removal options are intended to remediate alluvial groundwater within the Metro Storm Drain area.

- Alternative 1 – No Further Action.
- Alternative 2 – Capture and Treatment of Metro Storm Drain Base Flow.

- Alternative 3 – Removal of Accessible Diggings East and North Side Waste Materials (92,580 cubic yards with 35,750 cubic yards of overburden).
- Alternative 4 – Combination of Alternatives 2 and 3: Groundwater Capture and Treatment with Removal of Diggings East and North Side Tailings. Accessible waste material, (92,580 cubic yards with 35,750 cubic yards of overburden) would be removed.
- Alternative 5a – Removal of All Accessible Waste Material in the Metro Storm Drain with Groundwater Capture and Treatment. Total of 480,949 cubic yards of waste and 83,192 cubic yards of overburden from Parrott Tailings and Metro Storm Drain below Harrison Avenue (North Side Tailings, Diggings East Tailings, and the Lower Metro Storm Drain).
- Alternative 5b – Removal of Accessible Waste Material in the Metro Storm Drain with Removal and Reconstruction of the City-County Shops and Groundwater Capture and Treatment. A total of 779,684 cubic yards of waste and 103,735 cubic yards of overburden from the Parrott Tailings and Metro Storm Drain below Harrison Avenue (including the North Side Tailings, Diggings East Tailings, and the Lower Metro Storm Drain) would be removed.
- Alternative 6 – Total Removal of All Waste in the Metro Storm Drain with Groundwater Capture and Treatment. Total removal is 1,397,161 cubic yards of waste with 775,832 cubic yards of overburden for the entire area. All buildings, including residences and a shopping center, would be removed.

9.4 Common Elements of the Site-Wide Alternatives

Site-Wide Alternatives

The different Site-Wide alternatives have many elements in common.

- ***Operation and Maintenance/ Corrective Actions.*** All alternatives require long-term operation and maintenance of waste caps, solid media, and vegetation consistent with standards set in the Butte Reclamation Evaluation System. Areas that were reclaimed outside an EPA Order will be inspected to determine whether those previous actions are protective or if additional actions are warranted. Operation and maintenance of the LAO collection system and storm water system will continue, as will the monitoring of storm water and groundwater.
- ***Institutional Controls.*** All of the alternatives require the use of institutional controls to limit access to solid media and groundwater and maintain the integrity of the cleanup.
- ***Engineered Covers.*** Alternatives 2, 3, 4, and 5 specify the use of soil with revegetation, or rock, asphalt, or concrete covers for areas exceeding lead and arsenic action levels. Multimedia covers would also be used under specific conditions. Consolidation of wastes and grading is also specified for these areas in each of the alternatives.

- ***Partial Removal of Material.*** Alternatives 2, 3, 4, and 5 require limited, partial removal of areas exceeding lead and arsenic action levels. Areas that were reclaimed, but not under an EPA Order, will be evaluated to determine whether previous actions are protective or additional actions will be required. Residential soils exceeding lead, arsenic, or mercury action levels will be remediated pursuant to the Residential Metals Abatement Program described in other sections.
- ***Site Specific Reclamation of Certain Areas.*** Reclamation will be conducted for the area adjacent to the Granite Mountain Memorial Area. The Syndicate Pit will be reclaimed to the maximum extent practicable to allow site reuse as a mine training center. The reclamation will include rock covers, parking lot cap and vegetation soil cover over various portions of the pit. The design consists of a west rim berm planted with trees and various surface water controls on the west side of the pit. Surface water controls (e.g., curbs and gutters) will be implemented to direct storm water to the Syndicate Pit. The pit base would continue to be used as a sediment catch basin.
- ***Treatment of Wastes.*** Alternatives 3, 4, and 5 specify the use of waste treatment of mine wastes that fail TCLP testing to reduce toxicity and mobility.
- ***Indoor Residential Contamination.*** Alternatives 3, 4, and 5 specify soil and dust sampling and clean up, an attic dust program, and other actions to reduce human health risk.
- ***Closure of Waste Repository.*** All alternatives specify the closure of the waste repository and siting of new repositories as necessary.
- ***Storm Water BMPs.*** All alternatives except No Action require use of specific types of management, where appropriate. This may include source removals and controls, engineering controls, sedimentation basins, and routing. A phased approach will be used to determine the need for these management techniques.
- ***Sediment Removal.*** All alternatives, except no action, specify the removal of sediments and bank/overbank material from Silver Bow Creek in the reach from the confluence of Blacktail Creek and Metro Storm Drain to the point in Silver Bow Creek where the stream was reconstructed at Lower Area One.
- ***Collection of Storm Water Runoff and Treatment.*** All alternatives, except no action, specify that storm water runoff will be collected and treated or directed to the Berkeley Pit, if BMPs do not achieve cleanup goals.
- ***Collection, Routing, and Treatment of Groundwater.*** All of the alternatives specify that groundwater collected at LAO (in the hydraulic control channel and hydraulic control pond CT-04) will be treated. The differences among alternatives are in the type of treatment and the routing. Alternatives 4, 5, and 6 specify treatment by lime precipitation and discharge to Silver Bow Creek.

Metro Storm Drain

- **Waste Removal.** Alternatives 3, 4, 5a, 5b, and 6 all require some volume of waste removal. The difference is whether the removal is limited to the removal of accessible wastes or if structures will be removed to excavate otherwise inaccessible wastes.
- **Collection, Routing, and Treatment of Groundwater.** Alternatives 2, 4, 5a, 5b, and 6 all require capture of contaminated groundwater in the Metro Storm Drain and routing to Lower Area One for treatment.

9.5 Distinctions Among Alternatives

The following is a description of the elements that make each alternative unique, these elements may include RAOs to be achieved, estimated quantities of material to be removed, implementation requirements, key ARARs, future land use, estimated time to complete, or estimated costs.

Site-Wide Alternatives

- **Cost.** Costs vary widely with each alternative but are primarily driven by variations in volumes of waste that are considered for removal. Long-term O&M costs do not vary significantly across alternatives because these costs are driven primarily by groundwater treatment costs and the surface water management program. Estimated present value costs for each alternative are presented in Section 9.6.
- **Operation and Maintenance.** Alternatives that call for total removal of upland solid media source areas, residential yard soils, and contaminated interior and/or attic dust will require less O&M and/or institutional controls than partial removals. Where contaminated materials are completely removed, there will be no need for future programs to address contaminated solid media. This is not true for saturated wastes in the floodplain area. Groundwater capture and treatment and the associated O&M activities will be required over the long-term even if wastes are removed from the floodplain because of the residual contaminants in the groundwater and alluvial aquifer matrix, which will remain for over 100 years following removal.
- **Volume of Material Removed.** The volume of waste removed varies with each alternative. For Alternative 1, no more waste would be removed. Alternative 6 specifies total removal of all wastes exceeding lead and arsenic action levels. Because all contaminated materials will be removed, no covers would be required. Under Alternative 6, the Granite Mountain Memorial Area would be regraded and covered, and all slopes in the Syndicate Pit area would be regraded and capped with soil, and the site would not be used as mine training center or as a sediment basin.
- **Lead Intervention and Abatement Program.** For Alternative 1, the lead intervention and abatement program would be discontinued.
- **Indoor Residential Contamination.** Alternatives 1 and 2 have no provisions to address indoor residential contamination. Alternative 6 specifies a one-time cleaning of the

residential interior at properties undergoing yard cleanup or as part of a program to reduce the risk from dust during remodeling activities.

- **Collection, Routing, and Treatment of Groundwater.** Three of the alternatives (4, 5, and 6) require lime treatment of LAO groundwater and discharge to Silver Bow Creek. Alternatives 1 and 2 specify treatment with lime in lagoons in a wetland setting, similar to those evaluated during treatability studies, prior to being discharged to Silver Bow Creek. Alternative 3 specifies that the groundwater would be collected and conveyed via pipeline directly to the Berkeley Pit or to the Berkeley Pit treatment plant for combined treatment with water from the Berkeley Pit.
- **Use of Extraction Wells.** Alternative 6 would add the use of extraction wells installed at the west end of LAO to minimize migration of contaminants.
- **In-stream Flow Augmentation.** Alternative 2 specifies that groundwater base flow in the Metro Storm Drain would not be treated but would be augmented with clean water so that water quality standards are met in Silver Bow Creek

Metro Storm Drain

- **Volume of Material Removed.** Alternatives 3, 4, 5a, 5b, and 6 require some volume of waste removal. Alternatives 3 and 4 both remove only accessible wastes (92,580 cubic yards with 35,750 cubic yards of overburden). Alternative 5a broadens the removal area to include the Parrott tailings (except those under the City-County Shops) for a total of 480,949 cubic yards of waste and 83,192 cubic yards of overburden. Alternative 5b removes the City-County Shops to access more of the Parrott tailings (779,684 cubic yards of waste and 103,735 cubic yards of overburden). Alternative 6 removes all surface structures (including a shopping center and residences) and removes a total of 1,397,161 cubic yards of waste with 775,832 cubic yards of overburden.
- **Collection, Routing, and Treatment of Groundwater.** Alternatives 1 and 3 do not specify collection, routing, and treatment of groundwater from the Metro Storm Drain. Specifically, Alternative 3 evaluated the effectiveness of waste removal alone without groundwater capture and treatment and determined that removal alone would not be protective of Silver Bow Creek.

9.6 Comprehensive Alternatives

To develop the comprehensive alternatives, the Metro Storm Drain alternatives were integrated into Site-Wide alternatives. For example, Comprehensive Alternative 3 includes the components of Site-Wide Alternative 3 and Metro Storm Drain Alternative 2 (Table 9-1). Similarly, Comprehensive Alternative 5 includes the components of Site-Wide Alternative 5 and Metro Storm Drain Alternatives 4, 5a, and 5b. Table 9-2 shows the matrix of comprehensive alternatives in order to more simply present the components of each comprehensive alternative.

**Table 9-1
Comprehensive Alternatives Basis**

Comprehensive Alternative =A+B	Site-Wide FS (A)	Metro Storm Drain FFS (B)
1	1	1
2	2	1
3	3	2
4	4	2
5	5	4, 5a, 5b
6	6	6

Table 9-3 presents the estimated total costs for each alternative. Costs are broken down into capital costs and O&M costs to better show where costs are incurred and how costs vary across different alternatives and for different media. For this ROD, present value costs were estimated for 100 years using a discount factor of 3 percent. A 100-year period of analysis was selected because the incremental present worth cost beyond this time becomes relatively insignificant. The 3 percent discount factor at 100 years is 0.052. For example, if a cost of \$1,000,000 were anticipated in year 100, the present value of this cost would be \$52,000. When comparing alternative costs in the tens or hundreds of millions of dollars, these costs are insignificant by comparison. However, even though costs are estimated for 100-year duration, this should not be confused with the actual project duration. For example, groundwater treatment alternatives will be required well beyond 100 years, if not in perpetuity. Because all alternatives will require O&M in perpetuity, use of a consistent 100-year timeframe for all alternatives is appropriate to yield relative comparisons among the alternatives.

As was mentioned briefly in Section 9.5, alternative cost differences are driven by removal costs in the alluvial aquifer in Metro Storm Drain and Lower Area One. Because all alternatives will require some sort of O&M, regardless of removal, O&M costs do not vary significantly across alternatives.

**Table 9-2
Matrix of Comprehensive Alternatives**

Alternatives	Comprehensive Alternatives					
	1	2	3	4	5	6
SOLID MEDIA						
1. No Further Action ¹	Waste cover, solid media, and vegetation O&M	Waste cover, solid media, and vegetation O&M	Same as 2	Same as 2	Same as 2	Same as 2
2. Institutional Controls (ICs)	Existing ICs	ICs as appropriate	Same as 2	Same as 2	Same as 2	Same as 2
3. Soil, Rock Cover, & Revegetation		Covers for areas exceeding Pb and As action levels	Same as 2	Same as 2	Same as 2	
4. Asphalt/Concrete Cover		Criteria as above; these covers would only apply in site-specific conditions	Same as 2	Same as 2	Same as 2	
5. Consolidation/Grading		In conjunction with partial removal and covers	Same as 2	Same as 2	Same as 2	
6. Removal		In areas exceeding Pb and As action levels	Same as 2	Same as 2	Same as 2	
7. Total Removal						All mine-impacted material exceeding Pb or As action levels
8. Multimedia Cover		These covers would only apply in site-specific conditions (e.g., wastes with toxicity characteristic leaching potential)	Same as 2	Same as 2	Same as 2	
9. Treatment ²			Treat certain waste areas to reduce toxicity and mobility	Same as 3	Same as 3	
10. Residential Yards		Removal >Pb, As, and Hg action levels ³	Same as 2	Same as 2	Same as 2	All mine-impacted material >Pb, As, and Hg action levels
11. Indoor Residential Contamination			Soil and dust barriers, removal, dust remodeling program and/or other actions to reduce human health risk	Same as 3.	Same as 3.	One-time cleaning of residential interior for properties undergoing yard remediation; dust remodeling program
12. Waste Repository Closure		Close Repository	Same as 2	Same as 2	Same as 2	Same as 2

- 1 No Further Action implies that no response action will be taken in areas where a response has not previously been implemented and, areas where a response action has been conducted will be operated and maintained. Additionally, the remedial action for the Priority Soils OU will, at a minimum, include any and all remedial alternatives that have been mandated by a previous administrative order.
- 2 Method for treatment to be determined in Remedial Design. Water treatment may entail routing to Berkeley Pit treatment system.
- 3 A programmatic approach will be utilized to address residential yards, taking into account established action levels and sensitive populations.
- 4 Accessible indicates that wastes are not obstructed by a permanent feature such as a building, municipal infrastructure, or other structure that EPA considers having value sufficient to prohibit demolition for the purpose of removing the wastes.

**Table 9-2 (Cont.)
Matrix of Comprehensive Alternatives**

Alternatives	Comprehensive Alternatives					
	1	2	3	4	5	6
GROUNDWATER						
1. No Further Action ¹	Groundwater monitoring, operation of LAO collection system	Same as 1	Same as 1	Same as 1	Same as 1	Same as 1
2. Institutional Controls (ICs)	Existing ICs	ICs as appropriate	Same as 2	Same as 2	Same as 2	Same as 2
3. In-Stream Flow Augmentation		Augment MSD base flow to the extent necessary to meet DEQ-7 Standards in SBC.				
4. Collection, Routing, and Treatment ²	Treatment of LAO groundwater per ERA	LAO groundwater collected and treated by lime treatment in lagoons in a wetland setting.	LAO and MSD groundwater flow collected and redirected to the Berkeley Pit	Routing as needed to facilitate collection and treatment of LAO and MSD groundwater flow	Same as 4.	Same as 4.
5. Source Control		Saturated solid media left in place	Same as 2	Same as 2	Accessible ⁴ and saturated solid media partial removal	Total saturated solid media removal
SURFACE WATER						
1. No Further Action	Surface water monitoring, O&M of Storm Water TCRA facilities	Same as 1	Same as 1	Same as 1	Same as 1	Same as 1
2. Institutional Controls (ICs)	Existing ICs	ICs as appropriate	Same as 2	Same as 2	Same as 2	Same as 2
3. Best Management Practices (Source Controls, Engineering Controls, Sedimentation Basins, Routing)		Where Appropriate	Same as 2	Same as 2	Same as 2	Same as 2
4. In-Stream Flow Augmentation		Where Appropriate	Same as 2	Same as 2	Same as 2	Same as 2
5. Sediments Removal		Slag canyon and upper reaches of reconstructed channel in SBC	Same as 2	Same as 2	Same as 2	Same as 2
6. Collection/Treatment of Storm Water Runoff		Storm flow and base flow collected ⁶ and treated as required beyond implementation of BMPs	Same as 2	Same as 2	Same as 2	Same as 2

5 BMPs will be implemented as appropriate and to the extent necessary to mitigate soil erosion and contaminant transport at specific locations at the site. The remedial goal for BMPs is to achieve in-stream surface water quality standards (DEQ-7) in Silver Bow Creek for normal flow and runoff conditions. Individual BMPs will be designed to a location-specific basis and approved by the Agencies. If it is demonstrated that surface water quality standards cannot be achieved with BMPs alone, the Agencies will require surface water (including storm water runoff) treatment.

6 Storm water runoff flows up to specific design if other storm water response actions do not meet DEQ-7 standards. Treatment may entail routing to the Berkeley Pit treatment system.

Table 9-3
Costs of Each Comprehensive Alternative
Record of Decision
Butte Priority Soils Operable Unit
Silver Bow Creek/Butte Area NPL Site

	Comprehensive Alternative 1	Comprehensive Alternative 2	Comprehensive Alternative 3	Comprehensive Alternative 4 (Preferred Alternative)	Comprehensive Alternative 5	Comprehensive Alternative 6
Capital Costs						
<i>Solid Media</i>	–	\$16.3	\$20.1	\$33.4	\$20.1	\$44.7
<i>Groundwater</i>	–	\$0.09 – \$2.5	\$6.3	\$2.2	\$11.3 – \$57.1	\$221.8
<i>Surface Water</i>	–	\$3.3 – \$13.9	\$3.3 – \$13.9	\$21.3 – \$37.4	\$3.3 – \$13.9	\$3.3 – \$13.9
<i>New Capital Costs</i>	–	\$31	\$31	–	\$31	\$31
Total Capital Costs	\$0.05	\$49.8 – \$62.7	\$59.8 – \$70.4	\$57.0 – \$73.1	\$64.7 – \$121.1	\$300 – \$310
O&M Costs						
<i>No Further Action</i>	\$24.1	\$24.1	\$15.8	–	\$15.8	\$15.8
<i>Solid Media</i>	–	\$0.8	\$0.8	\$10.9	\$0.8	\$2.3
<i>Groundwater</i>	–	\$9.3 – \$14.0	\$15.8	\$13.3	\$16.9 – \$17.1	\$18.2
<i>Surface Water</i>	–	\$20.5 – \$40.5	\$20.5 – \$40.5	\$27.7 – \$58.6	\$20.5 – \$40.5	\$20.5 – \$40.5
O&M Costs	\$24.1	\$55.0 – \$79.9	\$53.0 – \$72.9	\$52.3 – \$83.3	\$54.8 – \$74.8	\$57.4 – \$77.4
Present Value Cost (100 years)	\$24.2	\$105 – \$143	\$113 – \$143	\$109.6 – \$156.6	\$119 – \$196	\$357 – \$388

Notes:

All costs in millions of dollars

Costs were modified from those presented in the Final FS and Proposed Plan through escalating 2004 costs to 2006 costs, and using a discount factor of 3% instead of 7%. See Sections 12 and 14 for further discussion.

Insignificant costs are not displayed in the summary table above. These included: Capital Costs for no action alternative and institutional controls; O&M Costs for institutional controls; and Periodic Costs for 5-year reviews

For the preferred alternative, the "No Further Action O&M Costs were allocated as appropriate among solid media, groundwater, and surface water.

The costs for Alternatives 1, 2, 3, 5, and 6 have been modified from those presented in the Proposed Plan to be comparable relative to the modifications to Alternative 4 (escalation of 2004 costs to 2006 costs, and using a discount factor of 3% instead of 7%). However, the costs were not re-calculated as rigorously as those for Alternative 4 (see Section 12), and should be considered approximate for comparative purposes only. Capital costs were multiplied by an escalation factor of 1.174 (2004-2006). O&M Costs were multiplied by 1.174 and then the ratio of the discount factors at 99 years for 3 percent and 7 percent ($31.547/14.268 = 2.211$). An additional \$31 million correction was added to account for the additional capital costs for the storm sewer system and shorter time frame for residential abatements and called "New Capital Costs".

This page left intentionally blank