TABLE 4.1
STATUS OF UPLAND SITES RELATED TO FORMER HONEYWELL OPERATIONS

Upland Site	Status	Description of Site Remediation
Willis Avenue (including I-690 underdrains)	Willis/Semet IRM - pre-design investigation in progress. Work plan is approved	Groundwater and DNAPL interception and removal
	RI, BERA and HHRA under review by DEC	To be determined
	Pilot study for isolation of underdrain flow complete	To be determined
Linden Chemicals and Plastics (LCP) Bridge Street (including West Flume)	OU-1 (main site) design is in progress, 100 % Design submitted OU-2 RI/FS in progress	Containment To be determined
Geddes Brook and Ninemile Creek	Geddes Brook IRM work plan approved - pre-design investigation complete Ninemile Creek: FS in progress	Sediment removal, wetland restoration To be determined
Matthews Avenue Site	PSA in progress	To be determined
Willis Avenue Ballfield Site	RI in progress	To be determined
Harbor Brook/ Wastebed B	RI in progress	To be determined
Semet Residue Ponds Site (including East Flume)	Pending NYSDEC approval to modify ROD	Recycling for beneficial use
	East Flume IRM – pre-design 50 percent design submitted to DEC on 10/2/03	Sediment removal
Wastebeds 1 to 8	Preliminary Site Assessment in progress. Work plan submitted and approved by NYSDEC.	To be determined
Dredge Spoils Area	PSA in progress. Work plan in preparation	To be determined
Main Plant	Data are being evaluated to determine what, if any, future activities are appropriate	To be determined
Wastebed B/Harbor Brook IRM	Wastebed B/Harbor Brook IRM - pre-design investigation in progress. Work plan is approved	Groundwater and DNAPL interception and removal

TABLE 4.2
STATUS OF NON-HONEYWELL UPLAND SITES

Site	Status As of Late 2002	Description of Site Remediation
General Motors former Inland Fisher Guide facility and Ley Creek deferred media site	RI/FS underway	To be determined
GM Old Ley Creek Channel site	RI/FS order under negotiation	To be determined
GM Dredgings site	Remediated based on March 1997 NYSDEC ROD (“hot spot” removal and capping)	No further action planned.
Town of Salina landfill	Proposed plan to be reissued by Mid-2004	To be determined
Oil City area	Remediation ongoing. Schedule dependent on Pyramid (mall developer) completing and implementing Carousel Center expansion. This expansion is to include the former Oil City Area.	Soil removal and removal of volatile organics
Former Niagara Mohawk Power Corporation manufactured gas plants on Hiawatha and Erie Boulevards	RI/FS efforts underway at both sites	To be determined

TABLE 4.2 (CONTINUED)
STATUS OF NON-HONEYWELL UPLAND SITES

Site	Status As of Late 2002	Description of Site Remediation
Metro Plant	Nutrient removal expansion ongoing.	Wastewater treatment upgrades
American Bag and Metal site	Investigation completed in 2002 under the NYS voluntary cleanup program	To be determined
Roth Steel	Preliminary site assessment to be conducted	To be determined
Crucible Materials Corporation and Crucible Lake Pump Station disposal site		To be determined
Electronics Park facility (Bloody Brook area)	Additional removal planned under the NYS voluntary cleanup program	Soil-sediment removal
Urban runoff	Control of combined sewer overflows ongoing by Onondaga County in accordance with amended consent judgment.	Complete items specified in amended consent judgment by 2012.

TABLE 4.3
LITTORAL AREA (SMUs 1 THROUGH 7)
DEVELOPMENT AND SCREENING OF ALTERNATIVES

ALTERNATIVE	DESCRIPTION	EFFECTIVENESS	IMPLEMENT	RELATIVE COST	COMMENTS	RETAINED?
Alternative 1 - No Action	No action would be taken in the lake, upland source areas would be remediated.	Not effective in addressing risks.	Implementable	Low	Retained for comparison purposes.	Yes
Alternative 2 - Habitat Enhancement	Installation of measures to stabilize calcitic materials and oncolites to improve habitat value and water clarity. No dredging or isolation capping is involved with this alternative.	Potentially effective for addressing ecological stresses associated with calcitic material in SMU 3 and oncolites in SMU 5. Not effective in addressing risks associated with exceedances of SECs or other risks.	Implementable	Low	Retained for SMUs 3 and 5, not retained for other SMUs.	Yes
Alternative 3 - Isolation Capping Alternative 3.A: Capping to Mean PECQ2 Alternative 3.B: Capping to Mean PECQ1 Alternative 3.C: Capping to AET Alternative 3.D: Capping to PEC Alternative 3.E: Capping to ER-L	Place sub-aqueous isolation cap over contaminated sediments. Cap would be resistant to chemical upwelling and erosive forces. Includes armoring where necessary.	Potentially effective for containing CPOIs exceeding SECs and improving lake habitat. Detailed evaluation required to fully evaluate effectiveness.	Potentially implementable. Detailed evaluation required to fully evaluate implementability.	Medium	Retained for SMUs where cap chemical isolation modeling indicates that targeted dredging is not required for the cap to be effective (SMUs 1, 2, 4, 5, and 7).	Yes

TABLE 4.3 (CONTINUED)
LITTORAL AREA (SMUs 1 THROUGH 7)
DEVELOPMENT AND SCREENING OF ALTERNATIVES

ALTERNATIVE	DESCRIPTION	EFFECTIVENESS	IMPLEMENT	RELATIVE COST	COMMENTS	RETAINED?
Alternative 4 - Dredging / Isolation Capping / Habitat Optimization Alternative 4.A: Capping to Mean PECQ2 Alternative 4.B: Capping to Mean PECQ1 Alternative 4.C: Capping to AET Alternative 4.D: Capping to PEC Alternative 4.E: Capping to ER-L Sub-alternative 1: Targeted dredging to enhance cap effectiveness including targeted dredging to 4 meter depth (for NAPL removal) and targeted dredging for full NAPL removal Sub-alternative 2: Dredging to result in no loss of lake surface area Sub-alternative 3: Dredging to a depth that optimizes habitat and reduces erosive forces on the cap Sub-alternative 4: Dredging to remove 25% of the ILWD (SMU 1 only)	Dredge to a specific design goal other than SEC compliance prior to construction of isolation cap.	Potentially effective for addressing CPOIs exceeding SECs and improving lake habitat. Detailed evaluation required to fully evaluate effectiveness.	Potentially implementable. Detailed evaluation required to fully evaluate implementability.	Medium-High		Yes

TABLE 4.3 (CONTINUED)
LITTORAL AREA (SMUs 1 THROUGH 7)
DEVELOPMENT AND SCREENING OF ALTERNATIVES

ALTERNATIVE	DESCRIPTION	EFFECTIVENESS	IMPLEMENT	RELATIVE COST	COMMENTS	RETAINED?
Alternative 4 - Dredging / Isolation Capping / Habitat Optimization (continued) Sub-alternative 5: Dredging for Mass Removal to 3 Meter Depth (SMU 1 only) Sub-alternative 6: Dredging for Mass Removal to 4 Meter Depth (SMU 1 only) Sub-option 7: Dredging for Mass Removal to 5 Meter Depth (SMU 1 only)	Dredge to a specific design goal other than SEC compliance prior to construction of isolation cap.	Potentially effective for addressing CPOIs exceeding SECs and improving lake habitat. Detailed evaluation required to fully evaluate effectiveness.	Potentially implementable. Detailed evaluation required to fully evaluate implementability.	Medium-High		Yes
Alternative 5 – Full Removal Option A: Full Removal (to Mean PECQ2) Option B: Full Removal (to Mean PECQ1) Option C: Full Removal (to AET) Option D: Full Removal (to PEC) Option E: Full Removal (to ER-L)	Dredge to SEC levels, and backfill as necessary..	Potentially effective for removing sediments which exceed SECs. Detailed evaluation required to fully evaluate effectiveness.	Potentially implementable. Detailed evaluation required to fully evaluate implementability.	High	The depth of impacted sediments that exceed SECs typically not fully delineated.	Yes

TABLE 4.4 - A
SMU 1 ALTERNATIVE SCREENING

Alternative	Title	Retained?	Comment
1	**No Action**	Yes	Retained
2	**Habitat Enhancement**	No	Not effective in addressing SEC exceedances.
3	**Capping / Habitat Optimization**		
3.A	Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4	**Dredging / Capping / Habitat Optimization**		
4.A.1	Targeted Dredging/Capping of Entire SMU	No	No targeted dredging is required for cap to be effective in isolating CPOIs with the shoreline barrier wall and hydraulic containment system in operation.
4.A.2	Dredging for NLSA[(3)]/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4.A.3	Dredging for NLSA & H&E[(4)]/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4.A.4	Dredging for Mass Removal to Remove 25% of ILWD/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4.A.5	Dredging for Mass Removal to 3 Meters/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4.A.6	Dredging for Mass Removal to 4 Meters/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4.A.7	Dredging for Mass Removal to 5 Meters/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
5	**Dredging**		
5.A	Full Removal (to Mean PECQ2, Mean PECQ1, AET, PEC or ERL)	Yes	Retained. Dredging volume is the same, and dredge depth exceeds limits of data regardless of SEC, therefore can accurately estimate dredge volumes or differentiate dredge volumes based on SEC. Therefore, all SEC-based dredge alternatives are combined for evaluation purposes.

Notes:
(1) Mean PEC quotient of 2 + mercury PEC
(2) Mean PEC quotient of 1 + mercury PEC
(3) Dredging sufficient sediments such that there is no loss of lake surface area following cap placement.
(4) Dredging sufficient sediments such that the depth after capping optimizes habitat potential and minimizes erosion potential.
(5) Habitat Optimization is a component of all Alternative 3 and 4 scenarios. However, for brievity, it has been omitted from all Alternative Titles.

TABLE 4.4 - B
SMU 2 ALTERNATIVE SCREENING

Alternative	Title	Retained?	Comment
1	**No Action**	Yes	Retained
2	**Habitat Enhancement**	No	Not effective in addressing SEC exceedances, therefore not retained.
3	**Capping / Habitat Optimization**		
3.A	Capping to Mean PECQ2[1], Mean PECQ1[2] or AET	Yes	Retained. Area requiring capping is the same regardless of whether the Mean PECQ2, Mean PECQ1 or AET is used.
3.D	Capping of Entire SMU	Yes	Retained. Entire SMU requires capping regardless of whether the PEC or ERL is used.
4	**Dredging / Capping / Habitat Optimization**		
4.A.1	Targeted Dredging/Capping to Mean PECQ2, Mean PECQ1 or AET	No	No targeted dredging is required for cap to be effective in isolating CPOIs with the shoreline barrier wall and hydraulic containment system in operation.
4.A.2	Dredging for NLSA[3]/Capping to Mean PECQ2, Mean PECQ1 or AET	No	Sediment removal volume only slightly less than for Alt. 4.A.3, which requires less rip-rap and provides greater habitat value.
4.A.3	Dredging for NLSA & H&E[4] & Targeted Dredging to 4 Meter Depth (for NAPL Removal)/Capping to Mean PECQ2, Mean PECQ1 or AET	Yes	Retained. Area and volume is the same regardless of whether the Mean PECQ2, Mean PECQ1 or AET is used. Although Targeted Dredging is not required, it is included for removal because it represents a clearly identifiable area of higher CPOI concentrations.
4.A.4	Dredging for NLSA[3] & H&E[4] & Full NAPL Removal/Capping to Mean PECQ2, Mean PECQ1 or AET	Yes	Retained. Area is the same regardless of whether the Mean PECQ2, Mean PECQ1 or AET is used.
4.D.1	Targeted Dredging/Capping of Entire SMU	No	No targeted dredging is required for cap to be effective in isolating CPOIs with the shoreline barrier wall and hydraulic containment system in operation.
4.D.2	Dredging for NLSA & Targeted Dredging/Capping of Entire SMU	No	Sediment removal volume only slightly less than for Alt. 4.D.3, which requires less rip-rap and provides greater habitat value.
4.D.3	Dredging for NLSA & H&E & Targeted Dredging to 4 Meter Depth (for NAPL Removal)/Capping of Entire SMU	Yes	Retained. Entire SMU requires capping regardless of whether PEC or ERL is used.
4.D.4	Dredging for NLSA[3] & H&E[4] & Full NAPL Removal/Capping of Entire SMU	Yes	Retained. Entire SMU requires capping regardless of whether PEC or ERL is used.
5	**Dredging**		
5.A	Full Removal (to Mean PECQ2, Mean PECQ1, or AET), Including NAPL	Yes	Retained. Dredging volume is the same, and dredge depth exceeds limits of data regardless of whether Mean PECQ2, Mean PECQ1 or AET used, therefore can not accurately estimate dredge volumes or differentiate dredge volumes based on these SECs. Therefore, these SEC-based dredge alternatives are combined for evaluation purposes.
5.D	Full Removal (to PEC or ERL), Including NAPL	Yes	Retained. Dredging volume is the same, and dredge depth exceeds limits of data regardless of whether PEC or ERL used, therefore can not accurately estimate dredge volumes or differentiate dredge volumes based on these SECs. Therefore, these SEC-based dredge alternatives are combined for evaluation purposes.

Notes:

:C quotient of 2 + mercury PEC

:C quotient of 1 + mercury PEC

t there is no loss of lake surface area following cap placement.

after capping optimizes habitat potential and minimizes erosion potential

d 4 scenarios. However, for brievity, it has been omitted from all Alternative Titles

TABLE 4.4 - C
SMU 3 ALTERNATIVE SCREENING

Alternative	Title	Retained?	Comment
1	**No Action**	Yes	Retained
2	**Habitat Enhancement**	Yes	Retained
3	**Capping / Habitat Optimization**	No	Based on cap modeling, capping without removal of near-shore sedimentsmay not be effective in containing CPOIs.
4	**Dredging / Capping / Habitat Optimization**		
4.A.1	Targeted Dredging/Capping to Mean PECQ2, Mean PECQ1 or PEC	No	Sediment removal volume only slightly less than for Alt. 4.A.3, which requires less rip-rap and provides greater habitat value.
4.A.2	Dredging for NLSA[(3)]/Capping to Mean PECQ2, Mean PECQ1 or PEC	No	Sediment removal volume only slightly less than for Alt. 4.A.3, which requires less rip-rap and provides greater habitat value.
4.A.3	Dredging for NLSA & H&E[(4)] and Targeted Dredging/Capping to Mean PECQ2, Mean PECQ1 or PEC	Yes	Retained. Area and volume are the same regardless of whether Mean PECQ2, Mean PECQ1 or PEC is used.
4.C.1	Targeted Dredging/Capping to AET	No	Area is similar to area that exceeds Mean PECQ2, but capping to AET less protective.
4.C.2	Dredging for NLSA and Targeted Dredging/Capping to AET	No	Area is similar to area that exceeds Mean PECQ2, but capping to AET less protective.
4.C.3	Dredging for NLSA & H&E and Targeted Dredging/Capping to AET	No	Area is similar to area that exceeds Mean PECQ2, but capping to AET less protective.
4.E.1	Targeted Dredging/Capping to ERL	No	Sediment removal volume only slightly less than for Alt. 4.E.3, which requires less rip-rap and provides greater habitat value.
4.E.2	Dredging for NLSA and Targeted Dredging/Capping to ERL	No	Sediment removal volume only slightly less than for Alt. 4.E.3, which requires less rip-rap and provides greater habitat value.
4.E.3	Dredging for NLSA & H&E and Targeted Dredging/Capping to ERL	Yes	Retained
5	**Dredging**		
5.A	Full Removal (to Mean PECQ2, Mean PECQ1 or PEC)	Yes	Retained. Dredging volume is the same, and dredge depth exceeds limits of data regardless of whether Mean PECQ2, Mean PECQ1 or PEC used, therefore can not accurately estimate dredge volumes or differentiate dredge volumes based on these SECs. Therefore, these SEC-based dredge alternatives are combined for evaluation purposes.
5.C	Full Removal (to AET)	No	Similar to Alternative 5.A, but smaller volume and less protective.
5.E	Full Removal (to ERL)	Yes	Retained. Dredging volume can not be accurately estimated because depth of SEC exceedance has not been delineated.

Notes:

(1) Mean PEC quotient of 2 + mercury PEC

(2) Mean PEC quotient of 1 + mercury PEC

(3) Dredging sufficient sediments such that there is no loss of lake surface area following cap placement.

(4) Dredging sufficient sediments such that the depth after capping optimizes habitat potential and minimizes erosion potential.

(5) Habitat Optimization is a component of all Alternative 3 and 4 scenarios. However, for brievity, it has been omitted from all Alternative Titles.

TABLE 4.4 - D
SMU 4 ALTERNATIVE SCREENING

Alternative	Title	Retained?	Comment
1	**No Action**	Yes	Retained
2	**Habitat Enhancement**	No	Not effective in addressing SEC exceedances, therefore not retained.
3	**Capping / Habitat Optimization**		
3.A	Capping of Entire SMU (to Mean PECQ2[1], Mean PECQ1[2], AET, PEC or ERL)	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4	**Dredging / Capping / Habitat Optimization**		
4.A.1	Targeted Dredging/Capping of Entire SMU	No	No targeted dredging is required for cap to be effective in isolating CPOIs.
4.A.2	Dredging for NLSA[3]/Capping of Entire SMU	No	Sediment removal volume only slightly less than for Alt. 4.A.3, which requires less rip-rap and provides
4.A.3	Dredging for NLSA & H&E[4]/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
5	**Dredging**		
5.A	Full Removal (to Mean PECQ2, Mean PECQ1, or AET)	Yes	Retained. Dredging volume and depth is the same based on existing data regardless of whether Mean PECQ2, Mean PECQ1, or AET used.
5.D	Full Removal (to PEC or ERL)	Yes	Retained. Dredging volume is the same, and dredge depth exceeds limits of data regardless of whether PEC or ERL used, therefore can not accurately estimate dredge volumes or differentiate dredge volumes based on these SECs. Therefore, these SEC-based dredge alternatives are combined for evaluation purposes.

Notes:
(1) Mean PEC quotient of 2 + mercury PEC
(2) Mean PEC quotient of 1 + mercury PEC
(3) Dredging sufficient sediments such that there is no loss of lake surface area following cap placement.
(4) Dredging sufficient sediments such that the depth after capping optimizes habitat potential and minimizes erosion potential.
(5) Habitat Optimization is a component of all Alternative 3 and 4 scenarios. However, for brievity, it has been omitted from all Alternative Titles.

TABLE 4.4 - E
SMU 5 ALTERNATIVE SCREENING

Alternative	Title	Retained?	Comment
1	**No Action**	Yes	Retained
2	**Habitat Enhancement**	Yes	Retained
3	**Capping / Habitat Optimization**		
3.A	Capping to Mean PECQ2 (1)	Yes	Retained.
3.B	Capping to Mean PECQ1 (2)	Yes	Retained.
3.C	Capping to AET	No	Only one exceedance of AET in entire SMU, therefore exceedance area assumed to be negligable.
3.D	Capping to PEC	Yes	Retained
3.E	Capping to ERL	Yes	Retained
4	**Dredging / Capping / Habitat Optimization**		
4.A.1	Targeted Dredging/Capping to Mean PECQ2	No	Capping will be effective in isolating CPOIs with no sediment removal, therefore not retained.
4.A.2	Dredging for NLSA(3)/Capping to Mean PECQ2	No	Sediment removal volume only slightly less than for Alt. 4.A.3, which requires less rip-rap and provides greater habitat value, therefore not retained.
4.A.3	Dredging for NLSA & H&E(4)/Capping to Mean PECQ2	Yes	Retained.
4.B.1	Targeted Dredging/Capping to Mean PECQ1	No	Capping will be effective in isolating CPOIs with no sediment removal, therefore not retained.
4.B.2	Dredging for NLSA/Capping to Mean PECQ1	No	Sediment removal volume only slightly less than for Alt. 4.B.3, which requires less rip-rap and provides greater habitat value, therefore not retained.
4.B.3	Dredging for NLSA & H&E/Capping to Mean PECQ1	Yes	Retained.
4.C.1	Targeted Dredging/Capping to AET	No	One exceedance of AET, at Bloody Brook, therefore exceedance area assumed to be negligable.
4.C.2	Dredging for NLSA/Capping to AET	No	One exceedance of AET, at Bloody Brook, therefore exceedance area assumed to be negligable.
4.C.3	Dredging for NLSA & H&E/Capping to AET	No	One exceedance of AET, at Bloody Brook, therefore exceedance area assumed to be negligable.
4.D.1	Targeted Dredging/Capping to PEC	No	Capping will be effective in isolating CPOIs with no sediment removal, therefore not retained.
4.D.2	Dredging for NLSA/Capping to PEC	No	Sediment removal volume only slightly less than for Alt. 4.D.3, which requires less rip-rap and provides greater habitat value, therefore not retained.
4.D.3	Dredging for NLSA & H&E/Capping to PEC	Yes	Retained
4.E.1	Targeted Dredging/Capping to ERL	No	Capping will be effective in isolating CPOIs with no sediment removal, therefore not retained.
4.E.2	Dredging for NLSA/Capping to ERL	No	Sediment removal volume only slightly less than for Alt. 4.E.3, which requires less rip-rap and provides greater habitat value, therefore not retained.
4.E.3	Dredging for NLSA & H&E/Capping to ERL	Yes	Retained
5	**Dredging**		
5.A	Full Removal (to Mean PECQ2)	Yes	Retained. Dredging volume can not be accurately estimated because depth of SEC exceedance has not been delineated.
5.B	Full Removal (to Mean PECQ1)	Yes	Retained. Dredging volume can not be accurately estimated because depth of SEC exceedance has not been delineated.
5.C	Full Removal (to AET)	No	Only one exceedance of AET in entire SMU, therefore exceedance volume assumed to be negligable.
5.D	Full Removal (to PEC)	Yes	Retained. Dredging volume can not be accurately estimated because depth of SEC exceedance has not been delineated.
5.E	Full Removal (to ERL)	Yes	Retained. Dredging volume can not be accurately estimated because depth of SEC exceedance has not been delineated.

Notes:

(1) Mean PEC quotient of 2 + mercury PEC

(2) Mean PEC quotient of 1 + mercury PEC

(3) Dredging sufficient sediments such that there is no loss of lake surface area following cap placement.

(4) Dredging sufficient sediments such that the depth after capping optimizes habitat potential and minimizes erosion potential.

(5) Habitat Optimization is a component of all Alternative 3 and 4 scenarios. However, for brievity, it has been omitted from all Alternative Titles.

TABLE 4.4 - F
SMU 6 ALTERNATIVE SCREENING

Alternative	Title	Retained?	Comment
1	**No Action**	Yes	Retained
2	**Habitat Enhancement**	No	Not effective in addressing SEC exceedances, therefore not retained.
3	**Capping / Habitat Optimization**	No	Based on cap modeling, capping without removal of near-shore sediments may not be effective in containing CPOIs.
4	**Dredging / Capping / Habitat Optimization**		
4.A.1	Targeted Dredging/Capping to Mean PECQ2	Yes	Retained
4.A.2	Dredging for NLSA(3) & Targeted Dredging/Capping to Mean PECQ2	No	No removal necessary to result in no loss of lake surface area following capping based on significant predicted settlement in SMU 6 following capping.
4.A.3	Dredging for NLSA & H&E(4) & Targeted Dredging/Capping to Mean PECQ2	Yes	Retained
4.B.1	Targeted Dredging/Capping to Mean PECQ1	Yes	Retained
4.B.2	Dredging for NLSA and Targeted Dredging/Capping to Mean PECQ1	No	No removal necessary to result in no loss of lake surface area following capping based on significant predicted settlement in SMU 6 following capping.
4.B.3	Dredging for NLSA & H&E and Targeted Dredging/Capping to Mean PECQ1	Yes	Retained
4.C.1	Targeted Dredging/Capping to AET	No	Area and volume is similar to area that exceeds Mean PECQ2, but capping to AET less protective.
4.C.2	Dredging for NLSA and Targeted Dredging/Capping to AET	No	Area and volume is similar to area that exceeds Mean PECQ2, but capping to AET less protective.
4.C.3	Dredging for NLSA & H&E and Targeted Dredging/Capping to AET	No	Area and volume is similar to area that exceeds Mean PECQ2, but capping to AET less protective.
4.D.1	Targeted Dredging/Capping of Entire SMU	Yes	Retained. Entire SMU requires capping regardless of whether PEC or ERL is used.
4.D.2	Dredging for NLSA and Targeted Dredging/Capping of Entire SMU	No	No removal necessary to result in no loss of lake surface area following capping based on significant predicted settlement in SMU 6 following capping.
4.D.3	Dredging for NLSA & H&E and Targeted Dredging/Capping of Entire SMU	Yes	Retained. Entire SMU requires capping regardless of whether PEC or ERL is used.
5	**Dredging**		
5.A	Full Removal (to Mean PECQ2)	Yes	Retained
5.B	Full Removal (to Mean PECQ1)	Yes	Retained
5.C	Full Removal (to AET)	No	Volume is similar to volume that exceeds Mean PECQ2, but dredging to AET less protective.
5.D	Full Removal (to PEC or ERL)	Yes	Retained. Dredging volume is the same, and dredge depth exceeds limits of data regardless of whether PEC or ERL used, therefore can not accurately estimate dredge volumes or differentiate dredge volumes based on these SECs. Therefore, these SEC-based dredge alternatives are combined for evaluation purposes.

Notes:
(1) Mean PEC quotient of 2 + mercury PEC
(2) Mean PEC quotient of 1 + mercury PEC
(3) Dredging sufficient sediments such that there is no loss of lake surface area following cap placement.
(4) Dredging sufficient sediments such that the depth after capping optimizes habitat potential and minimizes erosion potential.
(5) Habitat Optimization is a component of all Alternative 3 and 4 scenarios. However, for brievity, it has been omitted from all Alternative Titles.

TABLE 4.4 - G

SMU 7 ALTERNATIVE SCREENING

Alternative	Title	Retained?	Comment
1	**No Action**	Yes	Retained
2	**Habitat Enhancement**	No	Not effective in addressing SEC exceedances.
3	**Capping / Habitat Optimization**		
3.A	Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
4	**Dredging / Capping / Habitat Optimization**		
4.A.1	Targeted Dredging/Capping of Entire SMU	No	No targeted dredging is required for cap to be effective in isolating CPOIs, provided a shoreline barrier wall and hydraulic containment system is in place.
4.A.2	Dredging for NLSA(3)/Capping of Entire SMU	No	No removal necessary to result in no loss of lake surface area following capping based on significant predicted settlement in SMU 7 following capping.
4.A.3	Dredging for NLSA & H&E(4)/Capping of Entire SMU	Yes	Retained. Capping of the entire SMU is required regardless of the SEC.
5	**Dredging**		
5.A	Full Removal (to Mean PECQ2 or Mean PECQ1)	Yes	Retained. Dredging volume and depth is the same based on existing data regardless of whether Mean PECQ2 or Mean PECQ1 used.
5.C	Full Removal (to AET, PEC or ERL)	Yes	Dredging volume is the same, and dredge depth exceeds limits of data regardless of whether AET, PEC or ERL used, therefore can not accurately estimate dredge volumes or differentiate dredge volumes based on these SECs. Therefore, these SEC-based dredge alternatives are combined for evaluation purposes.

Notes:

(1) Mean PEC quotient of 2 + mercury PEC

(2) Mean PEC quotient of 1 + mercury PEC

(3) Dredging sufficient sediments such that there is no loss of lake surface area following cap placement.

(4) Dredging sufficient sediments such that the depth after capping optimizes habitat potential and minimizes erosion potential.

(5) Habitat Optimization is a component of all Alternative 3 and 4 scenarios. However, for brievity, it has been omitted from all Alternative Titles.

TABLE 4.5
RETAINED ALTERNATIVES AND AREAS AND VOLUMES

SMU	Alternative No.	New Alternative Name	Capping Area (Acres)	Total *In situ* Dredging Volume(5) (CY)	Estimated Dredging Duration(6) Using 1 Dredge (weeks)	Estimated Dredging Duration(6) Using 2 Dredges (weeks)
1	1	No Action	NA	NA	NA	NA
	3.A	Capping of Entire SMU	84	NA	NA	NA
	4.A.2	Dredging for NLSA[3]/Capping of Entire SMU	84	151,000	13	6
	4.A.3	Dredging for NLSA & H&E[4]/Capping of Entire SMU	84	354,000	30	15
	4.A.4	Dredging for Mass Removal to Remove 25% of ILWD/Capping of Entire SMU	84	1,015,000	85	42
	4.A.5	Dredging for Mass Removal to 3 Meters/Capping of Entire SMU	84	1,566,000	131	65
	4.A.6	Dredging for Mass Removal to 4 Meters/Capping of Entire SMU	84	2,094,000	175	87
	4.A.7	Dredging for Mass Removal to 5 Meters/Capping of Entire SMU	84	2,637,000	220	110
	5.A	Full Removal (to Mean PECQ2, Mean PECQ1, AET, PEC or ERL)	NA	4,028,000 +	336	168
2	1	No Action	NA	NA	NA	NA
	3.A	Capping to Mean PECQ2, Mean PECQ1 or AET	16	NA	NA	NA
	3.D	Capping of Entire SMU	34	NA	NA	NA
	4.A.3	Dredging for NLSA & H&E & Targeted Dredging to 4 Meter Depth (for NAPL Removal)/Capping to Mean PECQ2, Mean PECQ1 or AET	16	169,000	14	7
	4.A.4	Dredging for NLSA & H&E & Full NAPL Removal/Capping to Mean PECQ2, Mean PECQ1 or AET	16	403,000 +	34	17
	4.D.3	Dredging for NLSA & H&E & Targeted Dredging to 4 Meter Depth (for NAPL Removal)/Capping of Entire SMU	34	223,000	19	9
	4.D.4	Dredging for NLSA & H&E & Full NAPL Removal/Capping of Entire SMU	34	459,000 +	38	19
	5.A	Full Removal (to Mean PECQ2, Mean PECQ1, or AET)	NA	533,000 +	44	22
	5.D	Full Removal (to PEC or ERL)	NA	1,016,000 +	85	42
3	1	No Action	NA	NA	NA	NA
	2	Habitat Enhancement	NA	NA	NA	NA
	4.A.3	Dredging for NLSA & H&E and Targeted Dredging/Capping to Mean PECQ2 or PEC	29	75,000	6	3
	4.E.3	Dredging for NLSA & H&E and Targeted Dredging/Capping to ERL	119	341,000	28	14
	5.A	Full Removal (to Mean PECQ2, Mean PECQ1, or PEC)	NA	381,000 +	32	16
	5.E	Full Removal (to ERL)	NA	1,427,000 +	119	59
4	1	No Action	NA	NA	NA	NA
	3.A	Capping of Entire SMU	75	NA	NA	NA
	4.A.3	Dredging for NLSA & H&E/Capping of Entire SMU	75	135,000	11	6
	5.A	Full Removal (to Mean PECQ2, Mean PECQ1, or AET)	NA	2,170,000 +	181	90
	5.D	Full Removal (to PEC or ERL)	NA	3,563,000 +	297	148

TABLE 4.5
RETAINED ALTERNATIVES AND AREAS AND VOLUMES

SMU	Alternative No.	New Alternative Name	Capping Area (Acres)	Total *In situ* Dredging Volume(5) (CY)	Estimated Dredging Duration(6) Using 1 Dredge (weeks)	Estimated Dredging Duration(6) Using 2 Dredges (weeks)
5	1	No Action	NA	NA	NA	NA
	2	Habitat Enhancement	NA	NA	NA	NA
	3.A	Capping to Mean PECQ2	36	NA	NA	NA
	3.B	Capping to Mean PECQ1	60	NA	NA	NA
	3.D	Capping to PEC	220	NA	NA	NA
	3.E	Capping to ERL	349	NA	NA	NA
	4.A.3	Dredging for NLSA & H&E/Capping to Mean PECQ2	36	124,000	10	5
	4.B.3	Dredging for NLSA & H&E/Capping to Mean PECQ1	60	140,000	12	6
	4.D.3	Dredging for NLSA & H&E/Capping to PEC	220	429,000	36	18
	4.E.3	Dredging for NLSA & H&E/Capping to ERL	349	610,000	51	25
	5.A	Full Removal (to Mean PECQ2)	NA	124,000	10	5
	5.B	Full Removal (to Mean PECQ1)	NA	410,000	34	17
	5.D	Full Removal (to PEC)	NA	1,615,000 +	135	67
	5.E	Full Removal (to ERL)	NA	2,407,000 +	201	100
6	1	No Action	NA	NA	NA	NA
	4.A.1	Targeted Dredging/Capping to Mean PECQ2	94	148,000	12	6
	4.A.3	Dredging for NLSA & H&E & Targeted Dredging/Capping to Mean PECQ2	94	234,000	20	10
	4.B.1	Targeted Dredging/Capping to Mean PECQ1	123	148,000	12	6
	4.B.3	Dredging for NLSA & H&E and Targeted Dredging/Capping to Mean PECQ1	123	245,000	20	10
	4.D.1	Targeted Dredging/Capping of Entire SMU	156	346,000	29	14
	4.D.3	Dredging for NLSA & H&E and Targeted Dredging/Capping of Entire SMU	156	617,000	51	26
	5.A	Full Removal (to Mean PECQ2)	NA	2,650,000	221	110
	5.B	Full Removal (to Mean PECQ1)	NA	3,447,000	287	144
	5.D	Full Removal (to PEC or ERL)	NA	7,309,000 +	609	305
7	1	No Action	NA	NA	NA	NA
	3.A	Capping of Entire SMU	38	NA	NA	NA
	4.A.3	Dredging for NLSA & H&E/Capping of Entire SMU	38	89,000	7	4
	5.A	Full Removal (to Mean PECQ2 or Mean PECQ1)	NA	1,485,000 +	124	62
	5.C	Full Removal (to AET, PEC or ERL)	NA	2,168,000 +	181	90

NOTE: (+) Indicates that the volume is based on the limits of the data, but the depth of SEC exceedance has not been delineated.

TABLE 4. 6
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 1

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 CAPPING / HABITAT OPTIMIZATION	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION	ALTERNATIVE 5 FULL REMOVAL
		• **Alternative 3.A – Capping of Entire SMU**	• **Alternative 4.A.2 - Dredging for NLSA[1] /Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.3 - Dredging for NLSA & H&E[2] / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.4 – Dredging for Mass Removal to Remove 25% of SMU 1 / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.5 – Dredging for Mass Removal to Remove 3 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.6 – Dredging for Mass Removal to Remove 4 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.7 – Dredging for Mass Removal to Remove 5 Meters / Capping of Entire SMU / Habitat Optimization**	• **Alternative 5.A – Full Removal (to Mean PEC-Q2, Mean PECQ1, AET, PEC, or ER-L)**
Overall Protection of Human Health and the Environment	The No Action Alternative would not be protective of human health and the environment, since this would not actively address the contaminated sediment which present unacceptable risks of exposure to receptors or the release and transport of CPOIs at the site. The RAOs or PRGs would not be met under this alternative.	• Sediment capping would provide overall protection of human health and the environment by eliminating the potential human health and ecological exposure pathways associated with impacted sediment. Clean cap material would prevent direct exposure of humans and ecological receptors to contaminated sediment. Reduction in direct exposure to CPOIs and in potential CPOI releases to the water column are expected to reduce lake-wide risks to fish and to humans and wildlife that consume fish. • The cap would provide new sediment for benthic species to colonize, thereby increasing long-term taxa richness and diversity. Fish would benefit from the increased abundance and diversity of benthic macroinvertebrate prey and from the placement of fine gravel substrate designed to satisfy fish spawning requirements. Terrestrial receptors would benefit from potential enhancement of the prey base resulting from in-lake habitat improvements.	• Same as Alternative 3 except: o Dredging to result in no loss of lake surface area under Alternative 4.A.2, dredging for no loss of lake surface area and habitat optimization to minimize erosive forces under Alternative 4.A.3, would provide additional protectiveness by further improving the habitat value of the cap. Alternative 4.A.4, 4.A.5, 4.A.6 and 4.A.7, mass removal alternatives, provide the same level of protectiveness in SMU 1 as Alternatives 4.A.2 and 4.A.3 but provides less habitat value.	• Same as Alternatives 3 and 4 except: o Alternative 5 would provide overall protection of human health and the environment through removal of impacted sediments. Following dredging, SMU 1 would be backfilled to achieve an uniform slope from the shoreline to the outermost limits of the dredging. Additional backfilling would improve habitat value, but would increase remedial costs and increase short-term risks due to transportation of additional backfill required. Actual required backfilling requirements would be determined based on further evaluation as part of the design process, and would take into consideration the selected remedy on a lake-wide basis. o It is assumed that a 6-inch (15 cm) layer of fine gravel would be placed where the final water depth is between 6 and 15 ft (2 and 4.6m) to promote fish spawning. In addition, in areas where the water depth is appropriate for submerged macrophyte growth, i.e. 2 to 6 ft (0.6 to 2m), it is assumed that natural establishment of submerged macrophytes would be augmented by broadcast seeding and addition of tubers.
Compliance with ARARs	As described in Appendix C, ARARs and TBCs, there are chemical-specific ARARs for surface water quality. The No Action alternative would not meet these ARARs.	• As described in Section C.3.2 of Appendix C, ARARs and TBCs, this option would comply with chemical-specific, location-specific and action-specific ARARs, with the possible exception of the two most stringent surface water criteria for mercury. • There are no chemical-specific ARARs for sediment quality in Onondaga Lake. The SEC values identified for sediment in Onondaga Lake were used as TBCs in developing PRGs, as detailed in Section 2. This alternative is expected to comply with all designated location-specific and action-specific ARARs. Sediment caps are routinely	• As described in Section C.3.3 of Appendix C, ARARs and TBCs, this option would comply with chemical-specific, location-specific and action-specific ARARs, with the possible exception of the two most stringent surface water criteria for mercury. • There are no chemical-specific ARARs for sediment quality in Onondaga Lake. The SEC values identified for sediment in Onondaga Lake were used as TBCs in developing PRGs, as detailed in Section 2. The capping work is expected to comply with all designated location-specific and action-specific	• As described in Section C.3.4 of Appendix C, ARARs and TBCs, this option would comply with chemical-specific, location-specific and action-specific ARARs, with the possible exception of the two most stringent surface water criteria for mercury. • There are no chemical-specific ARARs for sediment quality in Onondaga Lake. The SEC values identified for sediment in Onondaga Lake were used as TBCs in developing PRGs, as detailed in Section 2. The capping work is expected to comply with all designated location-specific and action-specific ARARs. Sediment caps are routinely installed in compliance with ARARs, which would include the

TABLE 4. 6 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 1

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 CAPPING / HABITAT OPTIMIZATION • Alternative 3.A – Capping of Entire SMU	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • Alternative 4.A.2 - Dredging for NLSA(1) /Capping of Entire SMU / Habitat Optimization • Alternative 4.A.3 - Dredging for NLSA & H&E(2) / Capping of Entire SMU / Habitat Optimization • Alternative 4.A.4 – Dredging for Mass Removal to Remove 25% of SMU 1 / Capping of Entire SMU / Habitat Optimization • Alternative 4.A.5 – Dredging for Mass Removal to Remove 3 Meters / Capping of Entire SMU / Habitat Optimization • Alternative 4.A.6 – Dredging for Mass Removal to Remove 4 Meters / Capping of Entire SMU / Habitat Optimization • Alternative 4.A.7 – Dredging for Mass Removal to Remove 5 Meters / Capping of Entire SMU / Habitat Optimization	ALTERNATIVE 5 FULL REMOVAL • Alternative 5.A – Full Removal (to Mean PEC-Q2, Mean PECQ1, AET, PEC, or ER-L)
Compliance with ARAR's (Continued)		installed in compliance with ARARs, which would include the substantive requirements of the dredge and fill permit program under Section 404 of the federal Clean Water Act.	ARARs. Sediment caps are routinely installed in compliance with ARARs, which would include the substantive requirements of the dredge and fill permit program under Section 404 of the federal Clean Water Act. The dredging work may result in short-term localized exceedences of surface water criteria due to suspension of impacted sediment during dredging; however, the water quality impacts from dredging and the discharge of water from the SCA would meet the substantive water quality requirements imposed by New York State on entities seeking a dredged material discharge permit under Section 404 of the CWA. (This is described in more detail in the evaluation for sediment management options and water treatment in Section 4.12).	substantive requirements of the dredge and fill permit program under Section 404 of the federal Clean Water Act. The dredging work may result in short-term localized exceedences of surface water criteria due to suspension of impacted sediment during dredging; however, the water quality impacts from dredging and the discharge of water from the SCA would meet the substantive water quality requirements imposed by New York State on entities seeking a dredged material discharge permit under Section 404 of the CWA. (This is described in more detail in the evaluation for sediment management options and water treatment in Section 4.12).
Short-Term Effectiveness	The No Action alternative does not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to the community or workers as a result of its implementation.	• Physical construction of this alternative could likely be completed in approximately one construction season. The effects of this alternative during the construction and implementation phase would potentially include: o Temporary loss of lake habitat; o Temporary impacts associated with sedimentation to surrounding areas resulting from cap placement; o Temporary impacts of resuspension of CPOIs and potential release into the water column during cap placement, and potential impacts of resuspension on the natural recovery of the profundal sediments; o Potential for on-site worker and transportation accidents associated with remedial construction issues related to	• Same as Alternative 3 except: o Additional potential risk presented by volatilization of organics during dredging and materials handling; o Dredging, sediment handling, and dewatering may create air emissions and odors through release of SVOCs and VOCs from the dredge materials. However, significant odors and air emissions are not expected unless NAPL-containing VOCs are encountered. This short-term impact may be minimized or mitigated through engineering controls (e.g., silt curtains, surface absorbent booms and gunderbooms), including controlled dredging, wearing proper personal protective equipment (PPE), and adequate monitoring.	• Same as Alternatives 3 and 4 except: o Dredging the sediment volume would take several additional years to complete, using two dredges. It may be feasible to use more than two dredges simultaneously. However, implementation issues such as the number of dredges and dredging duration will be decided based on the total volume dredged on a lake-wide basis, the final dredge method used, and the disposal method. Therefore, to facilitate evaluation during evaluation of SMU-specific alternatives, the simplifying assumption is made that two dredges will be used in estimating SMU-specific dredging durations. Additional discussion on dredging durations using multiple dredges is provided during evaluation of lake-wide alternatives in Section 5.

TABLE 4. 6 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 1

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 CAPPING / HABITAT OPTIMIZATION • **Alternative 3.A – Capping of Entire SMU**	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • **Alternative 4.A.2 - Dredging for NLSA[1] /Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.3 - Dredging for NLSA & H&E[2] / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.4 – Dredging for Mass Removal to Remove 25% of SMU 1 / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.5 – Dredging for Mass Removal to Remove 3 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.6 – Dredging for Mass Removal to Remove 4 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.7 – Dredging for Mass Removal to Remove 5 Meters / Capping of Entire SMU / Habitat Optimization**	ALTERNATIVE 5 FULL REMOVAL • **Alternative 5.A – Full Removal (to Mean PEC-Q2, Mean PECQ1, AET, PEC, or ER-L)**
Short Term Effectiveness (Continued)		capping; and o Potential for on-site workers to receive adverse impacts through dermal contact with contaminated sediment. However, since no sediment is being removed the potential risk associated with adverse dermal contact is minimal. • It is anticipated that the potential risk to on-site workers could be mitigated by following appropriate health and safety protocols, by exercising sound engineering practices, and by utilizing proper protective equipment. Short-term risks are evaluated in greater detail during evaluation of lake-wide alternatives in Section 5 and in the Appendix I (risk of remedy), including quantitative estimation of releases of CPOIs to the air and surface water, and estimation of transportation risks. • Based on experience at other capping sites, the impacts are not anticipated to be significant. Proven, available engineering controls would be employed during implementation of this alternative to minimize the rate of sediment resuspension and material transport during capping activities, if required • The primary short-term negative ecological impact under this alternative would be the temporary elimination of benthic macroinvertebrate communities and macrophytes and related impacts by burial with clean sediments. Such impacts would be transitory, however, as macroinvertetrates and macrophytes would quickly begin to re-colonize suitable areas based on natural recolonization as well through application of seed and tubors during.	o This alternative could be implemented within a relatively short timeframe and would not have significant impacts to the surrounding community.	o The effects of this alternative during the construction and implementation phase would be similar to those in Alternative 4 but would be significantly greater in magnitude and duration, reflecting the much larger quantities of sediment being removed. Potential from short-term risks due to resuspension of CPOIs, release of NAPLs, air emissions of volatile CPOIs, would also occur over this period. o Implementation of this alternative would occur over an extended period (as noted above) and may have significant impacts to the surrounding community. Because of the longer period of implementation, quality of life issues could include delays in completing the planned walking and biking trail around the lake, impacts to areas where people congregate, proximity to residences, and impacts on canoeing, fishing, or other recreational uses of Onondaga Lake.

TABLE 4. 6 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 1

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 CAPPING / HABITAT OPTIMIZATION • **Alternative 3.A – Capping of Entire SMU**	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • **Alternative 4.A.2 - Dredging for NLSA[(1)] /Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.3 - Dredging for NLSA & H&E[(2)] / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.4 – Dredging for Mass Removal to Remove 25% of SMU 1 / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.5 – Dredging for Mass Removal to Remove 3 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.6 – Dredging for Mass Removal to Remove 4 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.7 – Dredging for Mass Removal to Remove 5 Meters / Capping of Entire SMU / Habitat Optimization**	ALTERNATIVE 5 FULL REMOVAL • **Alternative 5.A – Full Removal (to Mean PEC-Q2, Mean PECQ1, AET, PEC, or ER-L)**
Long-Term Effectiveness and Permanence	• This alternative does not provide significant long-term effectiveness. The SMU would be expected to continue to improve naturally over time; however, it would not effectively eliminate the potential exposure to contaminants in sediment and the rate of improvement is unpredictable and would not be verified due to the lack of monitoring under this alternative.	• This alternative would provide long-term effectiveness and permanence by eliminating the potential human health and ecological exposure pathways associated with impacted sediment. Chemical isolation modeling (Appendix H, capping issues) predicts that, with the Wastebed B hydraulic containment system in place to minimize upwelling velocities in SMU 1, a 2.5-ft (0.8-m) thick chemical isolation layer would result in no exceedances of the PEC at steady state. The cap is also expected to provide long-term effectiveness in preventing the migration through the cap of any residual NAPL present in SMU 1. • Consistent with EPA design guidance for caps, the cap would be designed to withstand erosional forces resulting from the 100-year return interval storm event (USEPA, 2002). Seismic evaluation of the geotechnical properties of the ILWD indicate that this material, and the cap placed on it, would not be subject to disturbance based on foreseeable seismic events. Institutional controls, such as bans on dredging the capped area, would be implemented as necessary to help ensure the long-term integrity of the cap. • A maintenance and monitoring program would be implemented to confirm that the cap remains effective over time.	• Same as Alternative 3 except: o Dredged sediments would be contained within the SCA, which would isolate dredged sediments from the environment, assuming proper design and monitoring at the landfill site. A proven long-term O&M program would ensure the adequacy and reliability of the SCA.	o Same as Alternative 4 except: o Alternative 5 provides long-term effectiveness and permanence by removing sediments from the lake environment that present unacceptable risks to human health and the environment.
Reduction of Toxicity, Mobility, or Volume Through Treatment	• The toxicity and volume of CPOIs in sediment would not be significantly reduced under the No Action alternative, because no treatment would be conducted. The overall bioavailability and mobility of	• Capping relies on isolation rather than treatment to achieve effectiveness. Capping would result in some reduction in the volume of the impacted sediment due to compaction resulting from the weight of the cap, although the overall reduction in volume would be relatively minor. In addition, natural process that reduce toxicity such as biological degradation of organic compounds would continue to occur beneath the cap following construction, although these processes may be	• Alternative 4 relies on isolation rather than treatment to achieve effectiveness. However, capping would result in some reduction in the volume of the impacted sediment due to compaction resulting from the weight of the cap. • Dredging processes would result in reducing the toxicity, mobility, and volume of the sediment. Volume would be reduced through consolidation and dewatering within the SCA.	• Same as dredging discussion under Alternative 4.

TABLE 4. 6 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 1

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 CAPPING / HABITAT OPTIMIZATION • **Alternative 3.A – Capping of Entire SMU**	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • **Alternative 4.A.2 - Dredging for NLSA(1) /Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.3 - Dredging for NLSA & H&E(2) / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.4 – Dredging for Mass Removal to Remove 25% of SMU 1 / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.5 – Dredging for Mass Removal to Remove 3 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.6 – Dredging for Mass Removal to Remove 4 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.7 – Dredging for Mass Removal to Remove 5 Meters / Capping of Entire SMU / Habitat Optimization**	ALTERNATIVE 5 FULL REMOVAL • **Alternative 5.A – Full Removal (to Mean PEC-Q2, Mean PECQ1, AET, PEC, or ER-L)**
Reduction of Toxicity, Mobility, or Volume Through Treatment (Continued)	contaminants in the sediment may be reduced over time as some natural recovery processes occur.	insignificant and would not be monitored or verified.	Dewatering would also reduce the mobility of the sediment. Treatment of water resulting from the dredging would reduce the toxicity, mobility and volume of CPOIs that are mobilized from the sediment into the water stream. Natural process that reduce toxicity, such as biological degradation of organic compounds, would continue to occur unmonitored beneath the cap or within the SCA The greater the volume of sediment removed, the greater the reduction in toxicity, mobility and volume that would result from these processes.	

TABLE 4. 6 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 1

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 CAPPING / HABITAT OPTIMIZATION • **Alternative 3.A – Capping of Entire SMU**	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • **Alternative 4.A.2 - Dredging for NLSA(1) /Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.3 - Dredging for NLSA & H&E(2) / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.4 – Dredging for Mass Removal to Remove 25% of SMU 1 / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.5 – Dredging for Mass Removal to Remove 3 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.6 – Dredging for Mass Removal to Remove 4 Meters / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.A.7 – Dredging for Mass Removal to Remove 5 Meters / Capping of Entire SMU / Habitat Optimization**	ALTERNATIVE 5 FULL REMOVAL • **Alternative 5.A – Full Removal (to Mean PEC-Q2, Mean PECQ1, AET, PEC, or ER-L)**
Implementability	• The No Action alternative would be easy to implement as there are no activities to undertake.	• Appropriate sediment capping technologies are readily available and implementable, and construction procedures are well established. Capping has been demonstrated as an effective remedial technology for impacted sediments at numerous sites, as discussed in the Appendix H, capping issues. Guidance documents are also available from numerous sources, including the USEPA and the USACE, on how to successfully design, construct, and monitor and sub-aqueous cap projects. The technology, equipment, subcontractors, personnel, and facilities required to successfully complete this alternative are available in the environmental market place. • Short-term and long-term monitoring of this alternative can be easily implemented to verify effectiveness. Additional remedial actions can readily be undertaken, such as repairing or upgrading the cap, should the alternative prove to be ineffective or partially ineffective.	• Appropriate dredging and sediment capping technologies are readily available and implementable, and construction procedures are well established. Dredging and capping have been demonstrated as effective remedial technologies for impacted sediments at numerous sites, as discussed in Appendices H (capping issues) and L (dredging issues), respectively. Guidance documents are also available from numerous sources, including the USEPA and the USACE, on how to successfully design, construct, and monitor dredging and sub-aqueous cap projects. The technology, equipment, subcontractors, personnel, and facilities required to successfully complete this alternative are available in the environmental market place. • Short-term and long-term monitoring of this alternative can be easily implemented to verify effectiveness. Additional remedial actions can readily be undertaken should the alternative prove to be ineffective or partially ineffective although greater dredge volumes would require either longer durations or additional dredging equipment.	• Dredging under Alternative 5 would be difficult to implement. The large volumes of sediment being removed under this alternative plus the length of time that it will take to fully implement this alternative will be challenging. Approximately 4,000,000 CY of sediment would be dredged in SMU 1 under this alternative. This would be a monumental undertaking and the large volume would have significant impacts on the implementabililty. Construction of the SCA to contain this volume of impacted sediment would be a major earthwork project. A facility of that size would entail literally creating a new hill in the City, which would make a visual impact on the community. The town of Camillus previously has restricted the height of Wastebed 15 to 468 feet above mean sea level, or 23 feet above the existing wastebed ground surface. Height restrictions will make implementation difficult. In addition, there are limitations related to on-site treatment and disposal of impacted sediments increase the length of time that will be require to fully implement this alternative.
Cost	• There are no costs associated with the No-Action Alternative.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.

Notes:
(1) – Dredging to result in no loss of lake surface area
(2) – Dredging to a depth to optimize habitat and minimize erosive forces

TABLE 4.7
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 2

EVALUATION CRITERIA	**ALTERNATIVE 1 NO ACTION**	**ALTERNATIVE 3 CAPPING / HABITAT OPTIMIZATION** • **Alternative 3.A – Isolation Capping to Mean PECQ2, Mean PECQ1 or AET** • **Alternative 3.D – Capping of Entire SMU**	**ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION** • **Alternative 4.A.3 - Dredging for NLSA[1] & H&E[2] Targeted Dredging to 4 Meter Depth (for NAPL Removal) / Capping to Mean PECQ2, Mean PECQ1 or AET / Habitat Optimization** • **Alternative 4.A.4 - Dredging for NLSA & H&E and Full NAPL Removal / Capping to Mean PECQ2, Mean PECQ1 or AET / Habitat Optimization** • **Alternative 4.D.3 - Dredging for NLSA & H&E & Targeted Dredging to 4 Meter Depth (for NAPL Removal) / Capping of Entire SMU / Habitat Optimization** • **Alternative 4.D.4 - Dredging for NLSA & H&E & Full NAPL Removal / Capping of Entire SMU / Habitat Optimization**	**ALTERNATIVE 5 FULL REMOVAL** • **Alternative 5.A – Full Removal (to Mean PECQ2, Mean PECQ1, or AET), including NAPL** • **Alternative 5.D – Full Removal (to PEC or ER-L), including NAPL**
Overall Protection of Human Health and the Environment	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3 except:. • Alternative 3.A addresses sediment that exceeds the critical mean PECQ2, Mean PECQ1 or AET and which, therefore, is expected to be toxic to benthic macroinvertebrates, as detailed in Appendix J, sediment effects concentrations. Alternative 3.D addresses sediment that exceeds the PEC or ERL which would not result in measurable improvement in reducing benthic toxicity compared to the mean PECQ2. Based on the exposure/response relationships determined empirically with the lake-wide database (Appendix J, sediment effects concentration), these sediments are not expected to contribute significantly to sediment toxicity. Use of the Mean PECQ1to deine remedial areas is more conservative and may provide an additional factor of safety in ensuring that sediments that may exhibit toxicity are addressed. However, in SMU 2, remedial areas are the same regardless of whether the Mean PECQ2 or Mean PECQ1 is used to define remedial areas.	• Same as Alternative 3 except: o Dredging for no loss of lake surface area and to a depth which optimizes habitat value and minimizes erosive forces under Alternatives 4.A.3 and 4.D.3 would provide additional protectiveness by further improving the habitat value of the cap. o Includes targeted dredging for cap effectiveness in areas where elevated pore water concentrations are present, either to a 4 meter depth (for NAPL Removal)(Alternatives 4.A.3 and 4.D.3) or for Full NAPL Removal (Alternatives 4.A.4 and 4.D.4).	• Same as Alternatives 3 and 4 except: o Following dredging, a residual cap would be placed if necessary to isolate any residual contamination, and a six-inch layer of fine gravel would be placed where the final water depth is between 6 and 15 ft (1.8 and 4.6 m) to promote fish spawning. In addition, in areas where the water depth is appropriate for submerged macrophyte colonization and establishment, i.e. 2 to 6 ft (0.6 to 1.8 m), it is assumed that natural establishment of submerged macrophytes would be augmented by broadcast seeding and addition of tubers, as discussed under capping in Subsection 4.3.3.
Compliance with ARARs	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Short-Term Effectiveness	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Long-Term Effectiveness and Permanence	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3 except: • The cap thickness (isolation layer) is 2.5 ft.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Reduction of Toxicity, Mobility, or Volume Through Treatment	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Implementability	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Cost	• There are no costs associated with the no-action alternative.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.

NOTES:
(1) – Dredging to result in no loss of lake surface area
(2) – Dredging to a Depth to Optimize Habitat and Minimize Erosive Forces

TABLE 4.8
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 3

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 HABITAT ENHANCEMENT	ALTERNATIVE 4 DREDGING/CAPPING/HABITAT OPTIMIZATION • **Alternative 4.A.3 – Dredging for NLSA[1] & H&E[2] & Targeted Dredging/Capping to Mean PECQ2, Mean PECQ1 or PEC/Habitat Optimization** • **Alternative 4.D.3 – Dredging for NLSA & H&E & Targeted Dredging/Capping to ERL/Habitat Optimization**	ALTERNATIVE 5 FULL REMOVAL • **Alternative 5.A – Full Removal (to Mean PECQ2, Mean PECQ1 or PEC)** • **Alternative 5.E – Full Removal (to ER-L)**
Overall Protection of Human Health and the Environment	• Same as SMU 1 Alternative 1	• This alternative would enhance overall protection of the environment by addressing ecological stressors identified in the BERA through creation of conditions suitable for macrophyte establishment and fish spawning. Resuspension of calcitic material that result in exceedances of narrative water quality standards would also be minimized. However, some areas of sediment that exceed the mean PECQ2 and therefore potentially pose risk to benthic macroinvertebrates would remain. Therefore, this alternative does not protect benthic macro-invertebrates in these areas.	• Same as Alternative 3 in SMU 2 except: o Dredging to result in no loss of lake surface area and to a depth that optimizes habitat value and minimizes erosive forces would provide additional benefit by further improving the habitat value of the cap. o Consistent with the discussion regarding remediation of sediments exceeding the Mean PECQ2 compared to remediation of additional sediments exceeding other SEC approaches, remediation to the Mean PECQ2 would address all sediments likely to exhibit toxicity to benthic macroinvertibrates. It is unlikely that remediation to the other SEC approaches would provide significant added protection.	• Same as Alternative 4 except: o Alternative 5 provides overall protection of human health and the environment through removal of impacted sediments. Areas of SMU 3 that present unacceptable risk would be dredged; therefore, all potential risks presented by SMU 3 would be eliminated.
Compliance with ARARs	• Same as SMU 1 Alternative 1	• As described in Section C.3.1 of Appendix C, ARARs and TBCs, this option would comply with chemical-specific, location-specific and action-specific ARARS, with the possible exception of the two most stringent surface water criteria for mercury. • There are no chemical-specific ARARs for sediment quality in Onondaga Lake. The SEC values identified for sediment in Onondaga Lake were used as TBCs in developing PRGs, as detailed in Section 2. This alternative is expected to comply with all designated location-specific and action-specific ARARs. Sediment caps are routinely installed in compliance with ARARs, which would include the substantive requirements of the dredge and fill permit program under Section 404 of the federal Clean Water Act.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5

TABLE 4.8 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 3

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 HABITAT ENHANCEMENT	ALTERNATIVE 4 DREDGING/CAPPING/HABITAT OPTIMIZATION • Alternative 4.A.3 – Dredging for NLSA[1] & H&E[2] & Targeted Dredging/Capping to Mean PECQ2, Mean PECQ1 or PEC/Habitat Optimization • Alternative 4.D.3 – Dredging for NLSA & H&E & Targeted Dredging/Capping to ERL/Habitat Optimization	ALTERNATIVE 5 FULL REMOVAL • Alternative 5.A – Full Removal (to Mean PECQ2, Mean PECQ1 or PEC) • Alternative 5.E – Full Removal (to ER-L)
Short-Term Effectiveness	• Same as SMU 1 Alternative 1	• Physical construction of this alternative could likely be completed in less than one year, and would result in minimal disturbance of impacted sediments. There are no significant implementation risks or quality-of-life issues associated with Alternative 2.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Long-Term Effectiveness and Permanence	• Same as SMU 1 Alternative 1	• The shoreline stabilization enhancements are designed to create a vegetated shoreline that would persist over time. The substrate would be augmented as needed to create a suitable growing medium over the short-term. As the plants grow and coalesce, their roots and stems would help to stabilize the shoreline over the long-term. In steeper areas of the shoreline, the slope would also be stabilized with riprap material. The material would be sized to provide long-term protection of the shoreline while the vegetation matures. • Fish habitat structures (i.e., large woody debris or similar) would be used in the shallow littoral areas (between 4 to 15 feet below ordinary low water) to provide habitat and cover for fish. The structures would be placed below 4 feet OLW to avoid wave energy associated with the 100-year storm events. These structures are anticipated to last several decades, depending on the decay rate of the woody material used for their construction.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Reduction of Toxicity, Mobility, or Volume Through Treatment	• Same as SMU 1 Alternative 1	• This alternative does not reduce the toxicity, mobility, or volume of impacted sediments.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5

TABLE 4.8
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 3

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 HABITAT ENHANCEMENT	ALTERNATIVE 4 DREDGING/CAPPING/HABITAT OPTIMIZATION • Alternative 4.A.3 – Dredging for NLSA(1) & H&E(2) & Targeted Dredging/Capping to Mean PECQ2, Mean PECQ1 or PEC/Habitat Optimization • Alternative 4.D.3 – Dredging for NLSA & H&E & Targeted Dredging/Capping to ERL/Habitat Optimization	ALTERNATIVE 5 FULL REMOVAL • Alternative 5.A – Full Removal (to Mean PECQ2, Mean PECQ1 or PEC) • Alternative 5.E – Full Removal (to ER-L)
Implementability	• Same as SMU 1 Alternative 1	• This alternative is readily implementable.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Cost	• There are no costs associated with the no-action alternative.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.	• Costs have not been developed for SMU-specific alternatives. Refer to Section 5.

NOTES:
(1) – Dredging to result in no loss of lake surface area
(2) - Dredging to a Depth to Optimize Habitat and Minimize Erosive Forces

TABLE 4.9
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 4

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 ISOLATION CAPPING / HABITAT OPTIMIZATION • **Alternative 3.A – Isolation Capping of Entire SMU / Habitat Optimization**	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • **Alternative 4.A.3 – Dredging for NLSA[(1)] & H&E[(2)] / Capping of Entire SMU /Habitat Optimization**	ALTERNATIVE 5 FULL REMOVAL • **Alternative 5.A – Full Removal (to Mean PECQ2, Mean PECQ1 or AET)** • **Alternative 5.D – Full Removal (to PEC or ER-L)**
Overall Protection of Human Health and the Environment	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as Alternative 3 except: o Dredging to a depth that optimizes habitat value and minimizes erosive forces would provide additional benefit by further improving the habitat value of the cap. This would include establishment of a significant area of new emergent wetland. In SMU 4, cleaner sediments overlie sediments with higher levels of mercury. Dredging prior to capping would result in higher levels of mercury at the bottom of the cap than if no dredging were completed prior to capping, which would slightly reduce the potential effectiveness of the cap. However, cap modeling indicates that the cap would be effective in either case in providing long-term effectiveness.	• Same as SMU 1 Alternative 5
Compliance with ARARs	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Short-Term Effectiveness	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Long-Term Effectiveness and Permanence	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3 except: o The cap thickness (isolation layer) is 2.5 ft.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Reduction of Toxicity, Mobility, or Volume Through Treatment	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Implementability	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Cost	• There are no costs associated with the no-action alternative.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.	• Costs have not been developed on SMU alternative basis. Refer to Section 5	• Costs have not been developed on SMU alternative basis. Refer to Section 5

NOTES:
(1) – Dredging to result in no loss of lake surface area
(2) – Dredging to a depth to optimize habitat and minimize erosive forces

TABLE 4.10
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 5

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 HABITAT ENHANCEMENT	ALTERNATIVE 3 ISOLATION CAPPING / HABITAT OPTIMIZATION • **Alternative 3.A – Isolation Capping to Mean PECQ2 / Habitat Optimization** • **Alternative 3.B – Isolation Capping to Mean PECQ1 / Habitat Optimization** • **Alternative 3.D – Isolation Capping to PEC / Habitat Optimization** • **Alternative 3.E – Isolation Capping to ER-L / Habitat Optimization**	ALTERNATIVE 4 DREDGING / ISOLATION CAPPING / HABITAT OPTIMIZATION • **Alternative 4.A.3 - Dredging for NLSA(1) & H&E(2) / Capping to Mean PECQ2 / Habitat Optimization** • **Alternative 4.B.3 - Dredging for NLSA(1) & H&E(2) / Capping to Mean PECQ1 / Habitat Optimization** • **Alternative 4.D.3 - Dredging for NLSA(1) & H&E(2) / Capping to PEC / Habitat Optimization** • **Alternative 4.E.3 - Dredging for NLSA(1) & H&E(2) / Capping to ERL / Habitat Optimization**	ALTERNATIVE 5 FULL REMOVAL • **Alternative 5.A – Full Removal (to Mean PECQ2)** • **Alternative 5.B – Full Removal (to Mean PECQ1)** • **Alternative 5.D – Full Removal (to PEC)** • **Alternative 5.E – Full Removal (to ER-L)**
Overall Protection of Human Health and the Environment	• The No Action Alternative is protective of human health and the environment with respect to hazardous substances based on the RI data. No sediment in SMU 5 exceeded the critical mean PECQ2, indicating that risk to benthic macroinvertebrates due to sediment toxicity is not predicted. • Baseline conditions in SMU 5 have little effect on lake-wide risks to fish, wildlife, and human health related to consumption of fish. Although there are three minor exceedances of the mercury PEC in SMU 5, concentrations of bioaccumulative CPOIs (e.g., mercury, PCDD/PCDFs) are not significantly elevated relative to other areas of the lake; therefore, SMU 5 is not considered a significant source of these CPOIs to the food web. Additional sampling would be required to verify this. Regarding sediment exposure, the HHRA (TAMS 2002b) considered the majority of SMU 5 to be part of the north basin, and risks associated with wading in near-shore sediment in the north basin only exceeded 10^{-6} for the reasonable maximum exposure scenario. • SMU 5 contains some of the highest densities of macrophytes and fish nests in Onondaga Lake. However, some portions of the SMU support few macrophytes and fish nests. The presence of oncolites in SMU 5 has been identified as an ecological stressor that impacts biological conditions, particularly submerged macrophyte colonization and establishment. These conditions are expected to continue in the absence of active remediation.	• This alternative would enhance the environment by creation of conditions suitable for macrophyte establishment and fish spawning. Baseline conditions in SMU 5 do not contribute significantly to human health or environmental potential risks in the lake, as discussed under the SMU 5 No Action Alternative. Therefore, this alternative would be protective of human health and the environment. • Hay bales and netting would be used initially to stabilize the substrates to allow colonization by submerged macrophytes. Once established, the macrophytes would act to stabilize the substrate both aboveground (where their shoots act to baffle wind and wave energy) and belowground (where their roots and rhizomes help to bind the sediment). In addition, the increase in macrophytes would increase the number of seeds and propagules available to help maintain and potentially expand the population and ensure long-term protection.	• Sediment capping in Alternative 3 would provide no additional protection of human health and little additional protection of the environment compared to baseline conditions, but would result in additional short-term potential risks. As discussed under the No Action Alternative, baseline conditions do not contribute to human health potential risks in the lake, and no sediment in SMU 5 exceeded the mean PECQ2 or mean PECQ1, indicating little risk to benthic macroinvertebrates due to sediment toxicity. Therefore, portions of SMU 5 is expected to provide little, if any, additional protection for benthic macroinvertebrates. Furthermore, concentrations of bioaccumulative CPOIs (e.g., mercury, PCDD/PCDFs) are not significantly elevated relative to other areas of the lake; therefore, SMU 5 is not considered a significant source of these CPOIs to the food web. Additional sampling would be required to verify this. • Capping would address ecological stresses associated with oncolites by covering them and providing new substrate.	• Consistent with the discussion of capping in SMU 5, dredging and capping in SMU 5 would provide no additional protection of human health and little additional protection of the environment compared to baseline conditions, but would result in increased short-term potential risks. Capping would address ecological stresses associated with oncolites by covering them and providing new substrate.	• Consistent with the discussion of capping in SMU 5, dredging in SMU 5 would provide no additional protection of human health and little additional protection of the environment compared to baseline conditions. Dredging would address ecological stresses associated with oncolites by removing them. However, dredging would increase the average water depth in SMU 5. This would reduce the area with a water depth of 2 to 6 ft (0.6 to 1.8 m), which is the optimal water depth for submerged macrophyte colonization and establishment, unless backfill material was added.

TABLE 4.10
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 5

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 HABITAT ENHANCEMENT	ALTERNATIVE 3 ISOLATION CAPPING / HABITAT OPTIMIZATION • Alternative 3.A – Isolation Capping to Mean PECQ2 / Habitat Optimization • Alternative 3.B – Isolation Capping to Mean PECQ1 / Habitat Optimization • Alternative 3.D – Isolation Capping to PEC / Habitat Optimization • Alternative 3.E – Isolation Capping to ER-L / Habitat Optimization	ALTERNATIVE 4 DREDGING / ISOLATION CAPPING / HABITAT OPTIMIZATION • Alternative 4.A.3 - Dredging for NLSA(1) & H&E(2) / Capping to Mean PECQ2 / Habitat Optimization • Alternative 4.B.3 - Dredging for NLSA(1) & H&E(2) / Capping to Mean PECQ1 / Habitat Optimization • Alternative 4.D.3 - Dredging for NLSA(1) & H&E(2) / Capping to PEC / Habitat Optimization • Alternative 4.E.3 - Dredging for NLSA(1) & H&E(2) / Capping to ERL / Habitat Optimization	ALTERNATIVE 5 FULL REMOVAL • Alternative 5.A – Full Removal (to Mean PECQ2) • Alternative 5.B – Full Removal (to Mean PECQ1) • Alternative 5.D – Full Removal (to PEC) • Alternative 5.E – Full Removal (to ER-L)
Compliance with ARARs	• Same as SMU 1 Alternative 1	• Same as SMU 3 Alternative 2	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Short-Term Effectiveness	• Same as SMU 1 Alternative 1	• Same as SMU 3 Alternative 2	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Long-Term Effectiveness and Permanence	• Same as SMU 1 Alternative 1	• Same as SMU 3 Alternative 2	• Same as SMU 1 Alternative 3 except: o The cap thickness (isolation layer) is 2.5 ft.	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Reduction of Toxicity, Mobility, or Volume Through Treatment	• Same as SMU 1 Alternative 1	• Same as SMU 3 Alternative 2	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Implementability	• Same as SMU 1 Alternative 1	• Same as SMU 3 Alternative 2	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Cost	• There are no costs associated with the no-action alternative.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.

Notes:

(1) – Dredging to result in no loss of lake surface area

(2) – Dredging to a depth to optimize habitat and minimize erosive forces

TABLE 4.11
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 6

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • Alternative 4.A.1 – Targeted Dredging / Isolation Capping to Mean PECQ2 / Habitat Optimization • Alternative 4.A.3 – Dredging for NLSA(1) & H&E(2) &Targeted Dredging / Isolation Capping to Mean PECQ2 / Habitat Optimization • Alternative 4.B.1 – Targeted Dredging / Isolation Capping to Mean PECQ1 / Habitat Optimization • Alternative 4.B.3 – Dredging for H&E and Targeted Dredging / Isolation Capping to Mean PECQ1 / Habitat Optimization • Alternative 4.D.1 – Targeted Dredging / Isolation Capping of Entire SMU / Habitat Optimization • Alternative 4.D.3 - Dredging for NLSA & H&E & Targeted Dredging / Isolation Capping of Entire SMU / Habitat Optimization	ALTERNATIVE 5 FULL REMOVAL • Alternative 5.A – Full Removal (to Mean PECQ2) • Alternative 5.B – Full Removal (to Mean PECQ1) • Alternative 5.D – Full Removal (PEC or ER-L)
Overall Protection of Human Health and the Environment	• Same as SMU 1 Alternative 1	• Dredging followed by capping in SMU 6 would provide overall protection of human health and the environment by eliminating the potential exposure pathways associated with impacted sediment. Clean cap material would prevent direct exposure of humans and ecological receptors to contaminated sediment, reduce or eliminate release of CPOIs from sediment to the water column, and provide enhanced habitat value through use of appropriate cap surface substrate. As discussed in Subsection 4.3, cap chemical isolation modeling predicts that, following removal of near-shore impacted sediments where groundwater upwelling is highest, a 1-ft (0.3-m) thick chemical isolation layer would result in no exceedances of the PEC in the bioturbation layer at steady state, virtually eliminating toxicity to benthic macroinvertebrates. • Areas of SMU 6 that present unacceptable risk would be capped; therefore, all potential risks presented by SMU 6 would be eliminated. • Consistent with the discussion regarding remediation of sediments exceeding the mean PECQ2 compared to remediation of additional sediments exceeding the other SEC approaches in Subsection 4.4.2.2.1, remediation to the Mean PECQ2 would address all sediments likely to exhibit toxicity to benthic marcroinvertibrates. It is unlikely that remediation to the other SEC approaches would provide significant added protection.	• Same as Alternative 4 except: • Alternative 5 provides overall protection of human health and the environment through removal of impacted sediments. Areas of SMU 6 that present unacceptable risk would be dredged; therefore, all potential risks presented by SMU 6 would be eliminated. • Consistent with the discussion of dredging of SMU 1 in Subsection 4.4.1.4, this evaluation assumes that backfill would be placed following dredging to achieve a constant slope from the shoreline out to the limits of dredging. It is assumed that a 6-inch (15-cm) layer of fine gravel would be placed where the final water depth is between 6 and 15 ft (1.8 and 4.6 m) to promote fish spawning. In addition, in areas where the water depth is appropriate for submerged macrophyte colonization and establishment, i.e. 2 to 6 ft (0.6 to 1.8 m), it is assumed that natural establishment of submerged macrophytes would be augmented by broadcast seeding and addition of tubers, as discussed under capping in Subsection 4.3.3.
Compliance with ARARs	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Short-Term Effectiveness	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Long-Term Effectiveness and Permanence	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Reduction of Toxicity, Mobility, or Volume Through Treatment	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Implementability	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Cost	• There are no costs associated with the no-action alternative.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.

Notes:
(1) – Dredging to result in no loss of lake surface area
(2) – Dredging to a depth to optimize habitat and minimize erosive forces

TABLE 4.12
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 7

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 ISOLATION CAPPING / HABITAT OPTIMIZATION • Alternative 3.A – Capping of Entire SMU / Habitat Optimization	ALTERNATIVE 4 DREDGING / CAPPING / HABITAT OPTIMIZATION • Alternative 4.A.3 - Dredging for NLSA(1) & H&E(2) / Capping of Entire SMU	ALTERNATIVE 5 FULL REMOVAL • Alternative 5.A – Full Removal (to Mean PECQ2 or Mean PECQ1) • Alternative 5.C – Full Removal (to AET, PEC, or ER-L)
Overall Protection of Human Health and the Environment	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 6 Alternative 4	• Same as SMU 1 Alternative 5
Compliance with ARARs	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Short-Term Effectiveness	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Long-Term Effectiveness and Permanence	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Reduction of Toxicity, Mobility, or Volume Through Treatment	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Implementability	• Same as SMU 1 Alternative 1	• Same as SMU 1 Alternative 3	• Same as SMU 1 Alternative 4	• Same as SMU 1 Alternative 5
Cost	• There are no costs associated with the no-action alternative.	• Same as SMU 1 Alternative 3	• Costs have not been developed on SMU alternative basis. Refer to Section 5.	• Costs have not been developed on SMU alternative basis. Refer to Section 5.

Notes:
(1) – Dredging to result in no loss of lake surface area
(2) – Dredging to a Depth to Optimize Habitat and Minimize Erosive Forces

TABLE 4.13
RECOMMENDED SMU-SPECIFIC ALTERNATIVES FOR INCLUSION IN LAKEWIDE ALTERNATIVES

SMU 1	
Alternative 3.A	Capping of Entire SMU / Habitat Optimization
Alternative 4.A.2	Dredging to Result in No Loss of Lake Surface Area / Capping of Entire SMU / Habitat Optimization
Alternative 4.A.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces / Capping of Entire SMU / Habitat Optimization
Alternative 4.A.4	Dredging for Mass Removal to Remove 25 % of ILWD / Capping of Entire SMU / Habitat Optimization
Alternative 4.A.5	Dredging for Mass Removal to Remove 3 Meters / Capping of Entire SMU / Habitat Optimization
Alternative 4.A.6	Dredging for Mass Removal to Remove 4 Meters / Capping of Entire SMU / Habitat Optimization
Alternative 4.A.7	Dredging for Mass Removal to Remove 5 Meters / Capping of Entire SMU / Habitat Optimization
Alternative 5.A	Full Removal (to Mean PECQ2, Mean PECQ1, AET, PEC or ERL)
SMU 2	
Alternative 3.A	Capping to Mean PECQ2 / Habitat Optimization
Alternative 4.A.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces and Targeted Dredging to 4 Meter Depth (for NAPL Removal) / Capping to Mean PECQ2, Mean PECQ1 or AET / Habitat Optimization
Alternative 4.A.4	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces and Full NAPL Removal / Capping to Mean PECQ2, Mean PECQ1 or AET / Habitat Optimization
Alternative 5.A	Full Removal (to Mean PECQ2), including NAPL
Alternative 5.D	Full Removal (to PEC or ERL), including NAPL
SMU 3	
Alternative 2	Habitat Enhancement
Alternative 4.A.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces and Targeted Dredging / Capping to Mean PECQ2, Mean PECQ1 or PEC / Habitat Optimization
Alternative 5.A	Full Removal (to Mean PECQ2, Mean PECQ1 or PEC)
Alternative 5.E	Full Removal (to ERL)
SMU 4	
Alternative 3.A	Capping of Entire SMU / Habitat Optimization
Alternative 4.A.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces / Capping of Entire SMU / Habitat Optimization

TABLE 4.13 (CONTINUED)
RECOMMENDED SMU-SPECIFIC ALTERNATIVES FOR INCLUSION IN LAKEWIDE ALTERNATIVES

SMU 4	
Alternative 5.A	Full Removal (to Mean PECQ2, Mean PECQ1 or AET)
Alternative 5.D	Full Removal (to PEC or ERL)
SMU 5	
Alternative 2	Habitat Enhancement
Alternative 4.A.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces / Capping to the Mean PECQ2 / Habitat Optimization
Alternative 4.B.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces / Capping to the Mean PECQ1 / Habitat Optimization
Alternative 4.E.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces / Capping to the ERL / Habitat Optimization
SMU 6	
Alternative 4.A.1	Targeted Dredging / Capping to Mean PECQ2 / Habitat Optimization
Alternative 4.A.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces / Capping to the Mean PECQ2 / Habitat Optimization
Alternative 4.B.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces and Targeted Dredging / Capping to the Mean PECQ1 / Habitat Optimization
Alternative 5.A	Full Removal (to Mean PECQ2)
Alternative 5.B	Full Removal (to Mean PECQ1)
Alternative 5.D	Full Removal (to PEC or ERL)
SMU 7	
Alternative 3.A	Capping of Entire SMU / Habitat Optimization
Alternative 4.A.3	Dredging to Result in No Loss of Lake Surface Area and to a Depth to Optimize Habitat and Minimize Erosive Forces / Capping to Mean PECQ2 / Habitat Optimization
Alternative 5.A	Full Removal (to Mean PECQ2 or Mean PECQ1)
Alternative 5.C	Full Removal (to AET, PEC or ERL)
SMU 8	
Alternative 6.A	Phased Thin-Layer Capping to Mean PECQ2, Hg PEC and BSQV / A/O / MNR
Alternative 6B	Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV / A/O / MNR
Alternative 6.E	Thin-Layer Capping to ERL, and BSQV / A/O

TABLE 4.14
DEVELOPMENT AND SCREENING OF ALTERNATIVES
PROFUNDAL AREA (SMU 8)

ALTERNATIVE	DESCRIPTION	EFFECTIVENESS	IMPLEMENT.	RELATIVE COST *	COMMENTS	RETAINED ?
Alternative 1: No Action	No action.	Not effective.	Implementable.	Low	Retained for comparison purposes.	Yes
Alternative 2: Monitored Natural Recovery (MNR)	Monitoring of a variety of physical, chemical, and biological processes that act singly or in combination to reduce chemical concentrations, exposure, or mobility of sediments in the profundal surface sediments.	Likely effective for reducing risks (RAO 4), but does not directly address mercury methylation (RAOs 1 and 3).	Implementable	Low	Not likely to be an effective stand-alone remedy. Modeled in Appendix N.	Not as stand-alone technology
Alternative 3: Phased Thin-Layer Capping	Introduce clean sediment to the profundal surface sediments by a variety of methods in areas not meeting the established cleanup criteria for CPOIs	Immediately effective in reducing chemical concentrations in the surface sediments (RAO 4). Reduces flux of methylmercury from profundal sediments (RAO 3). Does not directly address mercury methylation in the hypolimnion (RAO 1).	Implementable	Medium	Thin-layer capping was modeled in Appendix N. Differs from phased thin-layer capping, where natural recovery is considered.	Yes
Alternative 4: Phased Thin-Layer Capping / MNR	Introduce clean sediment to the surface sediments, by a variety of methods, in areas not expected to recover naturally (Phase I). Followed by MNR period (Phase II) and thin-layer capping and/or continued MNR in areas that do not recover after the MNR period (Phase III).	Effective for reducing risks (RAO 4), but does not directly address mercury methylation (RAO 1). For thin-layer cap areas, also reduces flux of methylmercury from profundal sediments (RAO 3).	Implementable	Medium	Thin-layer capping was modeled in Appendix N. Differs from thin-layer capping (Alt. 3), where areas are capped regardless of natural recovery potential.	Yes

TABLE 4.14 (CONTINUED)
DEVELOPMENT AND SCREENING OF ALTERNATIVES
PROFUNDAL AREA (SMU 8)

ALTERNATIVE	DESCRIPTION	EFFECTIVENESS	IMPLEMENT.	RELATIVE COST *	COMMENTS	RETAINED ?
Alternative 5: Aeration (Oxygenation) / MNR	MNR and aeration (oxygenation) of the hypolimnion.	Effective at reducing risks (RAO 4). Likely reduces methylation in hypolimnion (RAO 1) and methylmercury flux from profundal (RAO 3).	Implementable. Aeration (oxygenation) component requires pilot testing.	Low	Aeration (oxygenation) will somewhat slow the rate of sediment natural recovery due to increased bioturbation.	No (similar to Alt. 6, which is more effective)
Alternative 6: Phased Thin-Layer Capping / Aeration (Oxygenation) / MNR	Combination of Alternatives 4 and 5. Phase I includes thin-layer capping in areas not expected to recover naturally and aeration (oxygenation). Followed by MNR period with continued aeration (Phase II) and thin-layer capping and/or continued MNR or other con-tingency action in areas that do not recover naturally after the initial MNR period (Phase III).	Effective at reducing risks (RAO 4). Reduces methylation in hypolimnion (RAO 1) and methylmercury flux from profundal (RAO 3).	Implementable. Aeration (oxygenation) component requires pilot testing.	Medium	Aeration (oxygenation) will somewhat slow the rate of sediment natural recovery due to increased bioturbation.	Yes
Alternative 7: Isolation Capping	Isolation cap for all areas that do not meet the established cleanup criteria for CPOIs.	Immediately effective in reducing risks (RAO 4) and flux from profundal sediment (RAO 3). Does not directly address mercury methylation in the hypolimnion (RAO 1).	Implementable with some logistical considerations.	High	Long-term surface sediment concentrations the same as with MNR.	No

TABLE 4.14 (CONTINUED)
DEVELOPMENT AND SCREENING OF ALTERNATIVES
PROFUNDAL AREA (SMU 8)

ALTERNATIVE	DESCRIPTION	EFFECTIVENESS	IMPLEMENT.	RELATIVE COST *	COMMENTS	RETAINED ?
Alternative 8: Dredging	Dredge to the established cleanup criterion for CPOIs and on-site consolidation.	Potentially effective; however, does not directly address mercury methylation in the hypolimnion. Short-term risks associated with handling and disposal, both on-site and off-site. Constuctability an issue in deeper water. Construction period long (multiple seasons). Potential risks related to resuspension of sediment during dredging.	Implementable with some logistical considerations.	Very High	Long-term surface sediment concentrations the same as with MNR.	Yes (to have a full range of alternatives).

TABLE 4.15
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 8

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 THIN-LAYER CAPPING • Alternative A – Capping to Mean PECQ2 • Alternative B – Capping to Mean PECQ1 • Alternative E – Capping to ERL	ALTERNATIVE 4 PHASED THIN-LAYER CAPPING / MNR • Alternative A – Capping to Mean PECQ2 • Alternative B – Capping to Mean PECQ1 • Alternative E – Capping to ERL
Description	No action would be taken to address in-lake sources related to former Honeywell operations. As required by the NCP, it is used as a baseline for comparison purposes. The No Action Alternative assumes that the planned remediation of upland sites is successfully completed.	Assumes upland source controls and remediation of other SMUs within the lake. Installation of a thin-layer cap in areas with surface sediment concentrations that exceed the SECs. Thin-layer capping is based on the SEC adopted. As a result, only three alternatives are being considered for Alternative 3 (i.e., Alternatives 3.A, 3.B and 3.E) in SMU 8. Thin-layer capping to the AET requires capping of only slightly less area (i.e., 82 acres vs. 154 acres) than Alternative 3.B (i.e., thin-layer capping to the Mean PECQ1); but, it is less protective has not been retained. Thin-layer capping to the PEC is very similar to Alternative 3.E (i.e., thin-layer capping to the ER-L) with the exception of six small polygons totaling approximately 360 acres. The location of the areas exceeding the PEC, but not the ER-L, would be very difficult to distinguish once the remedy is implemented. Therefore, Thin-layer capping to the PEC has not been retained.	Assumes upland source controls and remediation of other SMUs within the lake. Includes a phased approach with Phase I activities in the profundal area initially including limited thin-layer capping in areas that have mercury concentrations that approach the maximum concentration expected for natural recovery to the PEC for areas that exceed the SECs (i.e., 20-acre area), followed by monitoring of natural recovery. Ongoing results from MNR (Phase II) would then be used to evaluate the need and location of additional thin-layer capping, if any (Phase III).
Overall Protection of Human Health and the Environment	The No Action Alternative would not be protective of human health and the environment, since this would not actively address the contaminated sediments that present unacceptable risks of exposure to receptors or the release and transport of CPOIs at the site. The RAOs or PRGs would not be met under this alternative.	Capping protects human health and the environment by eliminating the potential exposure pathways associated with impacted sediment. The addition of cap material would reduce negative effects that contaminants may have on the benthic invertebrate population and would allow a healthier population to develop (assuming that the oxygen status of the hypolimnion improves). Reduces or eliminates release of CPOIs from sediment to the water column. Reductions in CPOI releases to the water column are expected to reduce lake-wide risks to fish and humans/wildlife that consume fish (to the extent that inorganic mercury releases contribute to mercury methylation and bioaccumulation). However, anoxic conditions in the hypolimnion will continue to promote mercury methylation and limit benthic macroinvertebrate and fish populations in this region of the lake.	Capping, in conjunction with MNR resulting from upland source control and remediation of other SMUs, protects human health and the environment by eliminating the potential exposure pathways associated with impacted sediment. The addition of cap material would reduce negative effects that contaminants may have on the benthic invertebrate population and would allow a healthier population to develop (assuming that the oxygen status of the hypolimnion improves). Reduces or eliminates release of CPOIs from sediment to the water column. Reductions in CPOI releases to the water column are expected to reduce lake-wide risks to fish and humans/wildlife that consume fish (to the extent that inorganic mercury releases contribute to mercury methylation and bioaccumulation).
Compliance with ARARs	As described in Appendix C, ARARs and TBCs, there are chemical-specific ARARs for surface water quality. The No Action alternative would not met these ARARs.	As described in Section C.3.6 of Appendix C, ARARS and TBCs, this option would comply with chemical-specific, location-specific and action-specific ARARs, with the possible exception of the two most stringent surface water criteria for mercury.	As described in Section C.3.7 of Appendix C, ARARs and TBCs, this option would comply with chemical-specific, location-specific ARARs, with the possible exception of the two most stringent surface water criteria for mercury.
Short-Term Effectiveness	The No Action alternative does not include any physical construction measures in any areas of contamination and, therefore, would not present any potential adverse impacts to the community or workers as a result of its implementation.	This alternative would present low risk to the public because no sediments would be excavated or handled. Surface sediment concentrations would be reduced immediately after placement in targeted areas. Minimal implementation risk or quality of life issues are associated with this alternative.	This alternative would present low risk to the public because no sediments would be excavated or handled. Surface sediment concentrations would be reduced immediately after placement in targeted areas. Minimal implementation risk or quality of life issues are associated with this alternative.

TABLE 4.15 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 8

EVALUATION CRITERIA	ALTERNATIVE 1 NO ACTION	ALTERNATIVE 3 THIN-LAYER CAPPING • Alternative A – Capping to Mean PECQ2 • Alternative B – Capping to Mean PECQ1 • Alternative E – Capping to ERL	ALTERNATIVE 4 PHASED THIN-LAYER CAPPING / MNR • Alternative A – Capping to Mean PECQ2 • Alternative B – Capping to Mean PECQ1 • Alternative E – Capping to ERL
Long-Term Effectiveness and Permanence	This alternative does not provide significant long-term effectiveness. The SMU would be expected to continue to improve naturally over time; however, it would not effectively eliminate the potential exposure to contaminants in sediment and the rate of improvement is unpredictable and would not be verified due to the lack of monitoring under this alternative.	This alternative provides long-term effectiveness and permanence by reducing the potential human health and ecological exposure pathways associated with the impacted sediment in SMU 8. This alternative would have the following long-term effects on risks to human health and the environment: • Reduce sediment toxicity to benthic macroinvertebrates in this SMU (assuming hypolimnion becomes oxic in the future); • Reduce release of mercury to lake water diffusion and methane gas ebullition; • Reduce methylation of mercury in the hypolimnion to the extent that mercury concentration in profundal surface sediment contributes to methylmercury production; and • Reduce lake-wide risks associated with consumption of fish containing PCBs, PCDD/PCDFs, and mercury to the extent that sediment in this SMU contributes to lake-wide concentrations of these contaminants in fish. The long-term concentrations of mercury in the SMU are controlled by mercury concentrations in settling sediment particles (Appendix N, monitored natural recovery). However, mercury methylation would continue in the hypolimnion. Long-term performance of the alternative can be ensured through monitoring, maintenance, and contingency measures as needed.	This alternative provides long-term effectiveness and permanence by reducing the potential human health and ecological exposure pathways associated with the impacted sediment in SMU 8. This alternative would have the following long-term effects on risks to human health and the environment: • Reduce sediment toxicity to benthic macroinvertebrates in this SMU (assuming hypolimnion becomes oxic in the future); • Reduce release of mercury to lake water diffusion and methane gas ebullition; • Reduce methylation of mercury in the hypolimnion to the extent that mercury concentration in profundal surface sediment contributes to methylmercury production; and • Reduce lake-wide risks associated with consumption of fish containing PCBs, PCDD/PCDFs, and mercury to the extent that sediment in this SMU contributes to lake-wide concentrations of these contaminants in fish. The long-term concentrations of mercury in the SMU are controlled by mercury concentrations in settling sediment particles (Appendix N, monitored natural recovery). However, mercury methylation would continue in the hypolimnion. Long-term performance of the alternative can be ensured through monitoring, maintenance, and contingency measures as needed.
Reduction of Toxicity, Mobility, or Volume Through Treatment	The toxicity and volume of CPOIs in sediment would not be significantly reduced under the no action alternative, because no treatment would be conducted. The overall bioavailability and mobility of contaminants in the sediment may be reduced over time as some natural recovery processes occur.	This alternative would reduce toxicity by reducing the concentration of CPOIs in profundal surface sediments, the release of mercury to overlying water, and (indirectly) the rate of mercury methylation and bioaccumulation to the extent that these processes are controlled by the concentration of inorganic mercury. However, this reduced toxicity and mobility is achieved through containment rather than through active treatment. This alternative is not expected to reduce the volume of sediments that exceed the SECs.	This alternative would reduce toxicity by reducing the concentration of CPOIs in profundal surface sediments, the release of mercury to overlying water, and (indirectly) the rate of mercury methylation and bioaccumulation to the extent that these processes are controlled by the concentration of inorganic mercury. However, this reduced toxicity and mobility is achieved through containment rather than through active treatment. This alternative is not expected to reduce the volume of sediments that exceed the SECs.
Implementability	The No Action alternative would be easy to implement as there are no activities to undertake.	This alternative is readily implementable. Construction equipment to deliver, place, and spread a thin layer of material (e.g., dump trucks, loaders, dozers, blowers) and the required ancillary equipment are locally available. Local contractors are experienced in performing this type of task. Material is available from a variety of sources, including regional quarries. Construction specification compliance and long-term monitoring would be described in construction quality assurance and operations, monitoring, and maintenance plans.	This alternative is readily implementable. Construction equipment to deliver, place, and spread a thin layer of material (e.g., dump trucks, loaders, dozers, blowers) and the required ancillary equipment are locally available. Local contractors are experienced in performing this type of task. Material is available from a variety of sources, including regional quarries. Construction specification compliance and long-term monitoring would be described in construction quality assurance and operations, monitoring, and maintenance plans.
Cost	There are no costs associated with the No Action alternative.	Costs have been developed for the lake-wide alternatives (See Section 5).	Costs have been developed for the lake-wide alternatives (See Section 5).

TABLE 4.15 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 8

EVALUATION CRITERIA	ALTERNATIVE 6 PHASED THIN-LAYER CAPPING /AERATION (OXYGENATION) / MNR 6.A – Phased Thin-Layer Capping to Mean PECQ2, Hg PEC and BSQV / Aeration (Oxygenation) / MNR 6.B – Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV / Aeration (Oxygenation) / MNR 6.E – Phased Thin-Layer Capping to ERL, Hg PEC and BSQV / Aeration (Oxygenation) / MNR	ALTERNATIVE 8 DREDGING • Alternative A – Full Removal (to Mean PECQ2) • Alternative B – Full Removal (to PECQ1) • Alternative E – Full Removal (to ERL)
Description	Assumes upland source controls and remediation of other SMUs within the lake. Phased approach with Phase I activities in the SMU 8 including the initiation of natural recovery monitoring, the implementation of aeration/oxygenation, and limited thin-layer capping in areas not predicted to meet the SECs through natural recovery. Phase II would include continued monitoring to assess the effectiveness of natural recovery and aeration/oxygenation. Phase III would include thin-layer capping as a contingency, a continuation of aeration (oxygenation) if it has proven to be effective, and ongoing monitoring. Thin-layer capping is based on the SEC adopted and achieving the BSQV. As a result, only three alternatives are being considered for Alternative 6 (i.e., Alternatives 6.A, 6.B and 6.E) in SMU 8. Thin-layer capping to the AET requires capping of only slightly less area (i.e., 82 acres vs. 154 acres) than Alternative 6.B (i.e., thin-layer capping to the Mean PECQ1); but it is less protective and has not been retained. Thin-layer capping to the PEC is very similar to Alternative 6.E (i.e., thin-layer capping to the ER-L) with the exception of six small polygons totaling approximately 360 acres. The location of the areas exceeding the PEC, but not the ER-L, would be very difficult to distinguish once the remedy is implemented. Therefore, Thin-layer capping to the PEC has not been retained. In each case, additional thin layer capping may be required to achieve the BSQV for mercury. The BSQV will be compared to a SWAC calculated for a combination of littoral and profundal sediment, taking into account predicted mercury concentrations in sediment derived from the MNR model, as revised during the pre-design investigation.	This alternative includes dredging to SEC levels with subsequent on-site consolidation. Three options exist for this alternative: Alternative A, B and E. The use of these three alternatives has the same rationale as discussed under Alternative 6. The areas requiring dredging are the same as the areas requiring capping. The alternative assumes that upland source controls will be implemented.
Overall Protection of Human Health and the Environment	Aeration (oxygenation) would help protect human health and the environment by reducing methylation of mercury in the hypolimnion and subsequent bioaccumulation. Thin-layer capping and MNR, in conjunction with upland and in-lake source control, will reduce CPOI concentrations in surface sediment, providing protection to benthic macroinvertebrates. Decreased mercury concentrations in surface sediment will be reflected in decreased releases of mercury to overlying water. Decreased mercury methylation will result in decreased concentrations of mercury in fish tissue and risk to fish consumers.	Removal of sediment exceeding SECs will reduce CPOI concentrations in surface sediment, providing protection to benthic macroinvertebrates. Decreased mercury concentrations in surface sediment will be reflected in decreased releases of mercury to overlying water. Decreased mercury methylation will result in decreased concentrations of mercury in fish tissue and risk to fish consumers. However, anoxic conditions in the hypolimnion will continue to promote mercury methylation and limit benthic macroinvertebrate and fish populations in this region of the lake.
Compliance with ARARs	This would comply with chemical-specific, location-specific and action-specific ARARs, with the possible exception of the two stringent surface water criteria for mercury.	This option would comply with chemical-specific, location-specific and action-specific ARARs, with the possible exception of the two most stringent surface water criteria for mercury.
Short-Term Effectiveness	This alternative would present a low risk to the public because sediments would not be excavated or handled. Reductions in surface sediment total mercury concentrations would not occur immediately; rather, they would decrease over time as predicted by the natural recovery model (Appendix N, monitored natural recovery) and discussed below.	This alternative would not provide short-term effectiveness due to the long implementation time. However, the actual implementation sequencing and schedule would depend on the remedy for the entire lake. The short-term impacts would include: temporary loss of lake habitat and aquatic communities; impacts of resuspension of CPOIs and potential release into the water column; impacts of discharge of dewatering effluent on lake water quality; potential for on-site worker and transportation accidents associated with construction; and quality of life impacts associated with odor and increased truck traffic on local roads. Proven engineering and other controls are available and would be employed to minimize construction impacts including: rate of sediment resuspension and material transport, volatilization of CPOIs, worker injuries and fatalities, and impacts to fish. Community quality of life is expected to be impacted for this alternative, and no viable mitigation measures to appreciably reduce these impacts have been identified.

TABLE 4.15 (CONTINUED)
DETAILED EVALUATION OF ALTERNATIVES FOR SMU 8

EVALUATION CRITERIA	ALTERNATIVE 6 PHASED THIN-LAYER CAPPING /AERATION (OXYGENATION) / MNR 6.A – Phased Thin-Layer Capping to Mean PECQ2, Hg PEC and BSQV / Aeration (Oxygenation) / MNR 6.B – Phased Thin-Layer Capping to Mean PECQ1, Hg PEC and BSQV / Aeration (Oxygenation) / MNR 6.E – Phased Thin-Layer Capping to ERL, Hg PEC and BSQV / Aeration (Oxygenation) / MNR	ALTERNATIVE 8 DREDGING • Alternative A – Full Removal (to Mean PECQ2) • Alternative B – Full Removal (to PECQ1) • Alternative E – Full Removal (to ERL)
Long-Term Effectiveness and Permanence	This alternative provides long-term effectiveness and permanence by reducing the potential human health and ecological exposure pathways associated with the impacted sediment and anoxic conditions in SMU 8. This alternative would have the following long-term effects on risks to human health and the environment: • Reduce release of mercury to lake water via diffusion and methane gas ebullition; • Eliminate methylation of mercury in the hypolimnion to the extent that mercury concentration in profundal surface sediment contributes to methylmercury production; and • Reduce lake-wide risks associated with consumption of fish containing PCBs, PCDD/PCDFs, and mercury to the extent that sediment in this SMU contributes to lake-wide concentrations of these contaminants in fish. The long-term concentrations of mercury in the SMU are controlled by mercury concentration in settling sediment particles (Appendix N, monitored natural recovery). Long-term performance of the alternative can be ensured through monitoring, maintenance, and contingency measures as needed.	This alternative provides long-term effectiveness and permanence by reducing the potential human health and ecological exposure pathways associated with the impacted sediment in SMU 8. This alternative would have the following long-term effects on risks to human health and the environment: • Reduce release of mercury to lake water diffusion and methane gas ebullition; • Reduce methylation of mercury in the hypolimnion to the extent that mercury concentration in profundal surface sediment contributes to methylmercury production; and • Reduce lake-wide risks associated with consumption of fish containing PCBs, PCDD/PCDFs, and mercury to the extent that sediment in this SMU contributes to lake-wide concentrations of these contaminants in fish. Mercury methylation would continue in the hypolimnion.
Reduction of Toxicity, Mobility, or Volume Through Treatment	This alternative would reduce toxicity by reducing the concentration of CPOIs in profundal surface sediments, the release of mercury to overlying water, and (indirectly) the rate of mercury methylation and bioaccumulation to the extent that these processes are controlled by the concentration of inorganic mercury. However, this reduced toxicity and mobility is achieved through containment rather than through active treatment. This alternative is not expected to reduce the volume of sediments that exceed the SECs.	The volume of impacted media within the lake would be reduced under this alternative by removal of impacted sediment to site-specific SEC concentrations. The sediment removed would be transferred to the on-site SCA where the total volume of sediment would be reduced through in-place sediment consolidation and removal of water. Toxicity and volume of CPOIs is further reduced under these options through treatment of water during the sediment consolidation prior to discharge back to the lake. In addition, natural processes that reduce toxicity such as degradation of organic compounds would continue to occur in the SCA after construction. However, this reduced mobility and toxicity is achieved through containment rather than through active treatment. This alternative would treat (through consolidation and water removal/treatment) a greater volume of sediments than Alternative 4.
Implementability	Implementation of an aeration (oxygenation) system is feasible and could be done at a low cost. Equipment and trained personnel are readily available. However, pilot studies are recommended to further evaluate the potential effectiveness for reducing formation of methylmercury in the water column and reducing methylmercury concentrations in fish tissue. Construction equipment to deliver, place, and spread a thin layer of material (e.g., dump trucks, loaders, dozers, blowers) and the required ancillary equipment are locally available. Local contractors are experienced in performing this type of task. Material is available from a variety of sources, including regional quarries. Construction specification compliance and long-term monitoring would be described in construction quality assurance and operations, monitoring, and maintenance plans.	The same implementability issued related to dredging in the littoral zone apply to Alternative 8 in the profundal zone. However, significant additional implementability issued would be presented by this alternative to due the large volume of sediment that would be dredged. This would be a monumental undertaking, and the large volume would have significant impacts on implementatility. The sediment from SMU 8 only would be larger than any other contaminated sediment-dredging project ever done in the United States (MCSSD, 2002). If the material was placed 40 feet high, it would take over 140 acres to hold the dredged material Since the dredge slurry that is discharged into the settling basin would have essentially zero shear strength, the perimeter berms would have to be designed as earth dams. The design and operation would have to be carefully engineered to control the lateral loads on the perimeter berms to ensure that the SCA facility was stable during all construction seasons. The existing Wastebed material under the perimeter dikes may not have sufficient shear strength to support the dikes. This is often the case for the foundations of earth dams, and the soil has to be strengthened or replaced prior to building dams. The sequence of construction would require thorough analysis during design. The dredged slurry would experience several feet of self-weight consolidation settlement after it was placed in the SCA. The magnitude and rate of consolidation settlement depends on the thickness and properties of the material. With perimeter dikes 50 ft high and contaminated dredged material 40 to 45 feet thick, the consolidation settlement would take decades. The low strength and highly compressible nature of the dredged slurry would restrict future use of the SCA site. As discussed for littoral dredging, construction of the SCA to contain 9,000,000 to 15,000,000 CY would be a major earthwork project. With up to 15,000,000 CY dredged from the profundal zone alone, there may be space limitations in areas that are currently considered for siting the SCA. In addition, height restrictions will make implementation difficult. A facility to contain these dredged sediments would entail literally creating a new hill in the city, which would make a visual impact on the community. The town of Camillus previously has restricted the height of Wastebed 15 to 468 ft above mean sea level, or 23 ft above the existing Wastebed ground surface.
Cost	Costs have been developed for the lake-wide alternatives (See Section 5).	Costs have been developed for the lake-wide alternatives (See Section 5).

TABLE 4.16

ALTERNATIVE AREAS AND VOLUMES FOR PROFUNDAL AREA (SMU 8)

SMU	Alternative No.	Description	Capped Area (acres)	Cap Material Volume (CY)	Area of Dredge Surface (acres)	Total *In Situ* Dredge Volume(1) (CY)		Estimated Dredging Duration(2) Using 1 Dredge (weeks)	Estimated Dredging Duration(3) Using 2 Dredges (weeks)
8	1	No Action	NA	NA	NA	NA		NA	NA
	2	Monitored Natural Recovery (MNR)	NA	NA	NA	NA		NA	NA
	3.A	Thin-Layer Capping to mean PECQ2(4)	1562	1,260,013	NA	NA		NA	NA
	3.B	Thin-Layer Capping to Mean PECQ1(5)	1562	1,260,013	NA	NA		NA	NA
	3.E	Thin-Layer Capping to ER-L	1980	1,597,200	NA	NA		NA	NA
	4.A	Phased Thin-Layer Capping to Mean PECQ2(4)	20	16,133	NA	NA		NA	NA
	4.B	Phased Thin-Layer Capping to Mean PECQ1(5)	154	124,227	NA	NA		NA	NA
	4.E	Phased Thin-Layer Capping to ERL	1980	1,597,200	NA	NA		NA	NA
	6.A	Phased Thin-Layer Capping to Mean PECQ2(4), Aeration/Oxygenation, MNR	20	16,133	NA	NA		NA	NA
	6.B	Phased Thin-Layer Capping to Mean PECQ1(5), Aeration/Oxygenation, MNR	154	124,227	NA	NA		NA	NA
	6.E	Phased Thin-Layer Capping to Mean ERL, Aeration/Oxygenation, MNR	1980	1,597,200	NA	NA		NA	NA
	8.A	Dredging to mean PECQ2(4)	1562	NA	1562	9,392,923	+	783	470
	8.B	Dredging to Mean PECQ1(5)	1562	NA	1562	9,392,923	+	1256	754
	8.E	Dredging to ER-L	1980	NA	1980	15,077,368	+	1256	754

Notes:
(1) Volume estimated by multiplying area exceeding SEC value by depth of 0-1m and 1-2 m.
(2) Based on estimated production rate per dredge of 12,000 CY/week
(2) Based on estimated production rate per dredge of 20,000 CY/week
(4) Mean PECQ2 + Hg PEC
(5) Mean PECQ1 + Hg PEC

NA - Not applicable
(+) Indicates that the volume is based on the limits of the data, but the depth of SEC exceedance has not been delineated.

TABLE 4.17
ESTIMATED CAPACITIES OF POTENTIAL SEDIMENT CONSOLIDATION AREAS

Sediment Consolidation Area	Area[1] (acres)	Total Potential Capacity[2] (CY)	Potential Capacity for Onondaga Lake Sediment (CY)[3]	Potential Future Land Use	Comments
LCP Bridge Street OU-1	16	430,000	290,000	Parking/Light Industrial	Volume of materials from sources other than Onondaga Lake includes LCP OU-1, LCP OU-2, Geddes Brook, and Ninemile Creek. The potential capacity estimate assumes a 25% slope, a maximum height of 20 ft (including liner and cap system), and no setback from the proposed slurry wall (i.e., distance from wall to toe of slope).
Willis Avenue/Semet	51	380,000	300,000	Industrial Redevelopment	The potential capacity estimate accounts for material included from the Willis Avenue/Semet IRM and the Semet Tar Beds OU-2. The capacity assumes 25% slopes and a maximum height of 15 to 20 ft (including liner and cap system) at a combined consolidation area that includes the Willis Avenue Property, Semet Tar Pond Basins, and the remainder of the Semet Tar Property. A 25 ft setback from the property line (i.e., distance from property line to toe of slope) was assumed. If the Semet Tar Property is not available, the potential area decreases to 17 ac. Removing this acreage will correspondingly reduce the potential fill capacity.
Wastebed B	30	300,000	200,000	Recreational (Park)/Commercial	The capacity for Onondaga Lake materials assumes that the material removed from the East Flume and Wastebed B/Harbor Brook IRM would be disposed at Wastebed B. Additional capacity may be utilized based on the extent of wetlands remediation. The capacity assumes site reuse as recreational or commercial.
Wastebeds 9/10	68	1,100,000	1,100,000	Recreational/Parking/ Environmental Enhancements	The capacity assumes the full area is used with a maximum sediment thickness of 10 ft (dike height of 14 ft.). An initial fill thickness of 10 ft was used as this is a typical design thickness for a hydraulically-dredged sediment consolidation area. There are stability concerns with the underlying waste, and further geotechnical analyses are required. These analyses may indicate that thicknesses greater than 10 ft are acceptable.
Wastebed 11	52	840,000	840,000	Environmental Enhancements	The capacity assumes the full area is used with a maximum sediment thickness of 10 ft (dike height of 14 ft.). An initial fill thickness of 10 ft was used as this is a typical design thickness for a hydraulically-dredged sediment consolidation area. There are stability concerns with the underlying waste, and further geotechnical analyses are required. These analyses may indicate that thicknesses greater than 10 ft are acceptable.
Wastebed 12	120	1,900,000	1,900,000	Environmental Enhancements	The capacity assumes the full area is used with a maximum sediment thickness of 10 ft (dike height of 14 ft.). An initial fill thickness of 10 ft was used as this is a typical design thickness for a hydraulically-dredged sediment consolidation area. There are stability concerns with the underlying waste, and further geotechnical analyses are required. These analyses may indicate that thicknesses greater than 10 ft are acceptable.

TABLE 4.17
ESTIMATED CAPACITIES OF POTENTIAL SEDIMENT CONSOLIDATION AREAS

Sediment Consolidation Area	Area[1] (acres)	Total Potential Capacity[2] (CY)	Potential Capacity for Onondaga Lake Sediment (CY)[3]	Potential Future Land Use	Comments
Wastebed 13	150	2,400,000	2,400,000	Environmental Enhancements	The size of Wastebed 13 is an advantage in terms of flexibility for consolidation area design. The capacity assumes the full 150 ac area is used with a maximum sediment thickness of 10 ft (dike height of 14 ft.). An initial fill thickness of 10 ft was used as this is a typical design thickness for a hydraulically-dredged sediment consolidation area. There are stability concerns with the underlying waste, and further geotechnical analyses are required. These analyses may indicate that depths greater than 10 ft are acceptable.
Wastebed 14	120	1,900,000	1,900,000	Recreational/ Environmental Enhancements	The capacity assumes the full area is used with a maximum sediment thickness of 10 ft (dike height of 14 ft.). An initial fill thickness of 10 ft was used as this is a typical design thickness for a hydraulically-dredged sediment consolidation area. There are stability concerns with the underlying waste, and further geotechnical analyses are required. These analyses may indicate that thicknesses greater than 10 ft are acceptable.
Wastebed 15	79	920,000	920,000	Recreational/ Environmental Enhancements	The existing Town of Camillus C & D Landfill currently occupies 9 ac and will be expanding to 22 ac within the next four years. Therefore, the capacity assumes a 57 ac area (i.e., 79 ac minus 22 ac landfill) with a maximum sediment thickness of 10 ft (dike height of 14 ft.). An initial fill thickness of 10 ft was used as this is a typical design thiockness for a hydraulically-dredged sediment consolidation area. There are stability concerns with the underlying waste, and further geotechnical analyses are required. These analyses may indicate that depths greater than 10 ft are acceptable.

Notes:
1. Area and potential capacity estimates are approximate. Area estimates only include the approximate area within the dikes for the wastebeds.
2. Total capacity estimates for Willis Avenue/Semet, and Wastebeds 1-15 assume the areas are flat. Current survey data is required to address individual site features.
3. Potential Capacity for Onondaga Lake Materials equals the difference between the Total Potential Capacity and the assumed removal volume from upland sources.

CY - cubic yards
ft - feet

TABLE 4.18
OFF-SITE TRANSPORTATION AND DISPOSAL COSTS

Disposal Facility	Owner	Location	Distance (miles)	Transportation (Truck) ($/ton)	Disposal Nonhazardous ($/ton)	Transportation and Disposal ($/ton)	Daily Capacity (tons/day)	Total Capacity
High Acres Landfill	Waste Management	Fairport, NY	80	$16	$50	$66	3,500 (2,700 committed capacity)	1.9 million cubic yards constructed
Niagara Falls/Pine Avenue	Allied Waste	Niagara Falls, NY	165	$30	$30	$60	2,200 (1,700 committed capacity)	500,000 CY permitted; 1.8 million CY pending approval
CWM Chemical Services	Waste Management	Model City, NY	170	$31	$50	$81	4,400 (1,000 committed capacity)	1.2 million cubic yards constructed
American Landfill	Waste Management	Waynesburg, OH	390	$67	$18	$85	15,000	8.5 million CY currently permitted; 85 million CY pending approval
Atlantic Waste Disposal	Waste Management	Waverly, VA	525	$89	$22	$111	15,000 (3,750 committed capacity)	104 million CY permitted capacity

Notes:
1. Transportation costs (i.e., trucking) are based on information provided by Tonawanda Tank Transport, Inc.
2. Transportation costs (i.e., trucking) assume 1 hour demurrage fee ($65 per hour) would be required for approximately 10% of the loads.
3. Disposal costs based on vendor quotes from Waste Management and Allied Waste.
4. Committed capacity is based on current amounts of waste material being received by the facility
5. CY: cubic yards

TABLE 4.19
DETAILED EVALUATION OF SEDIMENT MANAGEMENT OPTIONS FOR ONONDAGA LAKE SEDIMENTS

Evaluation Criteria	Option 1 On-Site Consolidation at a Sediment Consolidation Area	Option 2 Off-Site Disposal at a Non-Hazardous Waste Landfill
Description	Stabilize Solvay wastebed using deep soil mixing and preloading, and construct on-site SCA at Wastebed 13 using imported fill and sand drainage layer. Pump sediment slurry from 14-inch hydraulic dredges to SCA via double-contained HDPE pipeline for solids settling and dewatering within SCA. Upon completion of dredging, construct cap on SCA and provide 30 years of monitoring to ensure continued containment of the dewatered sediment. Four in-situ sediment volumes are evaluated for this option: 100K CY, 500K CY, 1M CY, and 10M CY. Assumed dredging production rates, SCA aerial size, and dike heights for each of the volumes are: **100K CY**: 150 CY/hr / 12 acres / 14-ft. dikes **500K CY**: 300 CY/hr / 40 acres / 14-ft. dikes **1M CY**: 300 CY/hr / 80 acres / 14-ft. dikes **10M CY**: 600 CY/hr / 60 acres / 50-ft. dikes	Dredge channel, construct bulkhead and 20-acre process area on Wastebed B for sediment off-loading, solidification, stockpiling and truck loading. Off-load mechanically-dredged sediment from barge using clamshell crane and transport to process area. Solidify sediment by mixing in 10 percent lime and stockpile. Transfer solidified sediment to trucks and transport to off-site commercial non-hazardous waste landfill for disposal. Four in-situ sediment volumes are evaluated for this option: 100K CY, 500K CY, 1M CY, and 10M CY. Assumed mechanical dredging production rate is for one dredge at 130 CY/hr for all volumes due to trucking and stockpile area limitations. Based on currently available daily and total landfill capacities (Table 4.19) and solidified sediment daily production rates of 2,400 CY (3,400 tons), landfills have been combined into each sediment volume evaluation as follows: **100K CY**: High Acres (50%) / Niagara Falls/Pine Ave. (50%) **500K CY**: High Acres (50%) / Niagara Falls/Pine Ave. (50%) **1M CY**: High Acres (50%) / Niagara Falls/Pine Ave. (50%) **10M CY**: American Landfill (50%) / Atlantic Waste Disposal (50%)
Overall Protection of Human Health and the Environment	Option 1 would provide permanent containment of dredged sediments in an on-site SCA, which would be designed in accordance with applicable USACE and USEPA guidance for CDFs. CDFs are a reliable and proven method of containment of dredged sediments. Transfer of the sediment to the SCA would be in double-lined HDPE piping and the sediment would be dewatered within the SCA, minimizing the potential for accidental release of contaminated slurry. Potential air releases would be mitigated by active management of the slurry into the SCA and application of activated carbon to the water surface, as required. After dewatering of the sediment and capping of the SCA, long-term monitoring of groundwater for a period of 30 years would assess the proper containment of residual contaminants.	Off-site management of the mechanically-dredged sediment in Option 2 would provide permanent long-term containment of the dredged sediment at an off-site non-hazardous waste landfill. Landfills are a reliable and proven method of containment of waste materials. Dewatering and solidification of the sediment would be performed at a process area at near the lake. The shortage of currently available capacity in nearby landfills may require use of out-of-state landfills for larger volumes for sediment removal. For the 10,000,000 CY scenario, risk of injuries and fatalities associated with truck transport of the solidified sediment to the landfills increase significantly to 530 and 21 incidents, respectively (Appendix I).
Compliance with ARARs	As described in Appendix C, ARARs and TBCs, this option would comply with location-specific and action-specific ARARS. There are no chemical-specific ARARs for SCA design and construction. The list of ARARs and TBCs for the SCA include New York water quality regulations in 6 NYCRR Part 608; CWA regulations in 33 CRF Parts 320-330 and 40 CFR Parts 230 and 321; and New York solid waste regulation in 6 NYCRR Part 360. As described in Sections C.2.3.6 and C.2.3.10 of Appendix C, design and construction of an on-site SCA would comply with relevant and appropriate portions of CWA and its implementing regulations, along with guidance issued by the EPA and Army Corps of Engineers (which are TBCs). These regulations and guidance documents require that contaminated sediment containment facilities be designed and constructed to protect surface water, groundwater, air quality and a broad range of possible effects from potential contaminant releases. Thus design and construction of the SCA would provide protection to the same human populations and environmental endpoints as would a solid waste facility designed under 6 NYCRR Part 360. Unlike the solid waste regulations prepared for facilities that handle a wide range of municipal and industrial solid waste, the CWA regulations and guidance documents were prepared specifically for management of contaminated dredged material. In situations were there are competing relevant and appropriate requirements, the best approach is to select those ARARs that are most germane to the remedial options under consideration. In the case of the SCA, the CWA regulations and EPA and USACE guidance documents are the most relevant. They were specifically designed for the management of contaminated dredged material and include a system of laboratory tests, analytical methods and design criteria that would provide protection to human health and the environment.	This option would comply with location-specific and action-specific ARARs and TBCs described in Appendix C, ARARs and TBCs. There are no chemical-specific ARARs for off-site disposal in a non-hazardous waste landfill. The dewatered sediment would be taken to landfills that are designed and operated in accordance with current state and federal regulations for solid waste facilities. The temporary on-site dewatering and solidification work would be done in accordance with CWA and its implementing regulations, along with guidance issued by EPA and USACE, as described for Option 1.

TABLE 4.19 (CONTINUED)
DETAILED EVALUATION OF SEDIMENT MANAGEMENT OPTIONS FOR ONONDAGA LAKE SEDIMENTS

Evaluation Criteria	Option 1 On-Site Consolidation at a Sediment Consolidation Area	Option 2 Off-Site Disposal at a Non-Hazardous Waste Landfill
Short-Term Effectiveness	Potential risks to the community and environment include releases from the transfer piping and the SCA, as well as transportation risks associated with importing fill and construction materials. Transfer piping for the dredge slurry will be double-wall and will be inspected daily to prevent releases to the environment and exposures to the community. Air releases from the SCA are estimated in Appendix I. Naphthalene emissions from the SCA during dredging of SMU 2 yielded the highest potential risks to receptors. Potential air releases from the SCA would be mitigated by directing the slurry discharge deep below the water surface to minimize volatilization and maximized contaminant adsorption to the sediment particles. Air monitoring downgradient of the SCA and the addition of activated carbon to the water surface during periods of potential high contaminant volatilization would provide additional protection to the community. Risks posed by air releases from the SCA are less than risks posed by solidification for the off-site option. Because the sediment and entrained water will be pumped directly from the lake into the SCA, direct exposure of the sediment to on-site workers during normal operation of the SCA is not expected. Construction of the SCA would involve typical earth moving equipment and activities and no unusually dangerous working procedures are anticipated. Transportation of fill material to the construction site for preloading and construction of the dikes has been quantitatively evaluated for both non-fatal injury and fatality risks resulting from traffic accidents (Appendix I). These data, summarized below, show that risk of transportation injuries increases from less than one incident for the 100,000 CY volume to 16 incidents for the 10,000,000 CY volume. Likewise, the risk of transportation fatalities increases from the lower volume to just less than one fatality for the 10 million CY volume. Non-Fatal Injuries / Fatalities **100K CY** 9.5E-01 / 3.7E-02 **500K CY** 3.2E+00 / 1.2E-01 **1M CY** 6.1E+00 / 2.4E-01 **10M CY** 4.7E+01 / 1.8E+01 Use of a SCA for on-site management of sediment allows for multiple hydraulic dredges. For the 500,000 CY and 1,000,000 CY volumes two dredges are assumed. Four the 1,000,000 CY volume scenario, four dredges are assumed. As a result, dredging durations for the 500,000 CY and 1,000,000 CY volumes are 21 weeks (one year) and 42 weeks (2 years), respectively. Dredging duration for the 10,000,000 CY scenario is 209 weeks, or seven years (Table 4.21).	Short-term effectiveness for the Off-Site Disposal includes many of the same components as the On-Site Consolidation Option. The entire process area would be constructed on a bermed asphalt pad to provide additional containment. Air releases are expected to be most substantial during solidification of the sediments using front end loaders and staging of the solidified sediments in piles while awaiting loadout to the off-site landfill. Appendix I provides air release risk estimates for solidification of the sediment on a mixing pad. The highest estimated risks are associated with air releases of naphthalene from mixing SMU 2 sediments and are higher, but on the same order of magnitude, as releases from a SCA. Risks to on-site workers include those associated standard construction activities during construction of the bulkhead and process area. No unusually high-risk construction activities are anticipated. Exposure risks to on-site workers during the solidification and loadout of the solidified sediment would be mitigated by adherence to health and safety requirements and proper use of personal protective equipment. Daily production of an estimated 160 truckloads of dewatered and solidified sediment may have a negative impact on traffic between Wastebed B and Route 690. Transportation risks posed by the transport of the sediment to the off-site landfill present the largest risk during implementation of the remedy and have been quantitatively evaluated for both incidence of non-fatal injuries and fatalities (Appendix I). These data, summarized below, show that risk of transportation injuries increases substantially with volume, from approximately one incident for the 100,000 CY volume to 530 injuries for the 10,000,000 CY volume. The risk of transportation fatalities also increases from the lower volumes to an estimated 21 deaths for off-site disposal of the 10,000,000 CY sediment volume. Non-Fatal Injuries / Fatalities **100K CY** 1.5E+00 / 6E-02 **500K CY** 7.3E+00 / 2.9E-01 **1M CY** 1.5E+10 / 5.7E-01 **10M CY** 5.3E+02 / 2.1E+01 One mechanical dredge with a 6 CY clamshell bucket has an average production rate of 130 CY/hr or 2,100 CY per 16-hour day. This yields an average daily production rate of 2,400 CY or 3,400 tons assuming solidification with lime and 15 percent bulking. As a result of traffic and space limitations at Wastebed B, this daily production volume is considered the maximum feasible rate for Option 2. Dredging durations using this rate for the four sediment volume scenarios result in 10 weeks (1 year) for 100,000, 48 weeks (2 years) for 500,000, 97 weeks (4 years) for 1,000,000 CY, and 962 weeks (35 years) for 10,000,000 CY (Table 4.21).
Long-Term Effectiveness and Permanence	The SCA used in Option 1 would be designed in accordance with applicable USACE and USEPA guidance for CDFs to be protective of human health and the environment. The SCA would provide effective long-term containment of the dredged sediments. SCAs (CDFs) are reliable, proven, and accepted technology for the long-term containment of dredged sediments. Groundwater monitoring wells installed surrounding the SCA in the Solvay wastebeds would monitor the effectiveness of the SCA for a period of 30 years.	Option 2 would utilize an off-site permitted non-hazardous waste landfill for effective and reliable long-term management and containment of the solidified sediments. Landfills are a reliable, proven, and accepted technology for the long-term containment of hazardous and non-hazardous waste material. The off-site landfill would be constructed and operated in compliance with applicable solid waste management requirements including liner and capping components and groundwater monitoring. Long-term monitoring of the off-site landfill would be in compliance with the landfill's permit requirements.

TABLE 4.19 (CONTINUED)
DETAILED EVALUATION OF SEDIMENT MANAGEMENT OPTIONS FOR ONONDAGA LAKE SEDIMENTS

Evaluation Criteria	Option 1 On-Site Consolidation at a Sediment Consolidation Area	Option 2 Off-Site Disposal at a Non-Hazardous Waste Landfill
Reduction of Toxicity, Mobility, or Volume Through Treatment	Option 1 would not reduce the toxicity, mobility, or volume through treatment since active treatment of the sediment would not occur. However, consolidation of the sediment in the SCA would reduce the volume of sediment and mobility of contaminants through the dewatering process. Additional immobilization of the contaminants would be provided by the containment properties afforded by the SCA.	Option 2 would not reduce the toxicity, mobility, or volume through treatment since active treatment of the sediment would not occur. However, solidification of the sediment would reduce the mobility of residual contaminants, but would increase the sediment volume by approximately 15%.
Implementability	Construction of a SCA on one of the Solvay wastebeds may require some stabilization of the wastebeds to mitigate the potential for settling. However, the stabilization techniques anticipated, preloading and/or deep-soil mixing, are standard and reliable stabilization technologies. SCA would be designed and constructed in accordance to USACE and USEPA guidance for CDFs and would use standard earthwork construction techniques. Special equipment or materials would not be required. Clean fill material for construction of the dikes is available nearby and other construction materials are readily available. The SCA would operate during dredging as a CDF in accordance with applicable guidance. CDFs have been used effectively and reliably to manage and provide long-term containment for sediments. Air monitoring during dredging and groundwater monitoring during SCA operation, closure and post-closure would allow for regular monitoring for releases from the SCA. Construction and operation of the SCA for the 10M CY volume would be significantly more challenging than the smaller volumes due to a number of issues including the volume of material that would be required to construct the 50-foot high dikes. Additionally, construction of the 50-foot high dikes atop of an existing 55-foot high wastebed may meet some resistance from the town of Camillus, as there is currently a height restriction for development on Wastebed 15.	Option 2 is implementable and has been used effectively and many remediation sites. The most cost-effective landfill identified, Niagara Falls/Pine Ave., does not currently have the daily capacity to receive the anticipated daily production from one 6 CY mechanical dredge. Therefore, an additional landfill, High Acres landfill in Fairport, NY, would be required to meet the anticipated daily production. An estimated 160 20-ton loads would be trucked from Wastebed B to the two landfills, which could have a negative impact on local traffic between Wastebed B and Route 690. These traffic issues would likely be more pronounced and unacceptable to local government with increasing waste volume and the associated long duration of remedial activities under this scenario. For the 10,000,000 CY volume, total capacities of proximate landfills within the State of New York may be exceeded and use of out-of-state landfills may required, increasing the cost and short-term risks associated with the remedy.
Cost	Costs associated with this option include stabilization of the Solvay wastebed, construction and operation of the SCA, associated transfer piping from the lake, SCA capping, and 30 years post-closure monitoring and maintenance. Actual stabilization requirements for the wastebeds are currently unknown due to the lack of quality geotechnical data. For the purposes of cost presentation, the costs presented below assume enhanced primary treatment of the supernatant. Capital, operating, and long-term maintenance costs for management of each of the sediment volumes in the SCA are presented in Table 4.20, which also includes costs for other supernatant treatment options. Additional assumptions and detailed cost estimates for each of the sediment volumes are provided in Appendix K.	Capital costs for the off-site disposal option include barge channel dredging, and construction of a bulkhead and process area for off-loading and solidification of the sediment. Operational costs include sediment off-loading, solidification and stockpiling operations, loadout and truck transportation to an off-site non-hazardous waste landfill, and disposal at the landfill. Capital, operating, and total costs for off-site disposal for each of the sediment volumes are presented in Table 4.21. Appendix K provides additional detail regarding these cost estimates.

TABLE 4.20

SEDIMENT MANAGEMENT AND SUPERNATANT TREATMENT COST AND DURATION SUMMARY

Volume/ Cost Element	Sediment Management Option 1 (On-site Consolidation)					Sediment Management Option 2 (Off-site Disposal)
		Water Treatment Costs				
	SCA Costs	Primary	Enhanced Primary	Enhanced Primary w/ Multimedia Filtration	Advanced	
100,000 CY						
Capital Cost	$ 14,765,376	$ -	$ 7,732,538	$ 12,968,963	$ 26,237,625	$ 21,561,498
Operating Cost	$ 1,028,199	$ 6,475	$ 51,800	$ 73,815	$ 644,910	$ 10,122,875
Long Term O&M (NPV)	$ 1,040,405	$ -	$ -	$ -	$ -	$ -
Total Water Treatment Cost		$ 6,475	$ 7,784,338	$ 13,042,778	$ 26,882,535	
Total SCA Cost	$ 16,833,980	$ 16,833,980	$ 16,833,980	$ 16,833,980	$ 16,833,980	
Total Option Cost		**$ 17,000,000**	**$ 25,000,000**	**$ 30,000,000**	**$ 44,000,000**	**$ 32,000,000**
Dredging Duration	9 weeks / 1 year					10 wks/1 yr
500,000 CY						
Capital Cost	$ 35,682,029	$ -	$ 7,732,538	$ 12,968,963	$ 26,237,625	$ 33,825,712
Operating Cost	$ 2,628,505	$ 32,375	$ 259,000	$ 369,075	$ 3,224,550	$ 50,614,375
Long Term O&M (NPV)	$ 1,233,088	$ -	$ -	$ -	$ -	$ -
Total Water Treatment Cost		$ 32,375	$ 7,991,538	$ 13,338,038	$ 29,462,175	
Total SCA Cost	$ 39,543,623	$ 39,543,623	$ 39,543,623	$ 39,543,623	$ 39,543,623	
Total Option Cost		**$ 40,000,000**	**$ 48,000,000**	**$ 53,000,000**	**$ 69,000,000**	**$ 84,000,000**
Dredging Duration	21 weeks / 1 year					48 wk /2 yrs
1,000,000 CY						
Capital Cost	$ 60,608,257	$ -	$ 7,732,538	$ 12,968,963	$ 26,237,625	$ 49,155,979
Operating Cost	$ 5,260,356	$ 64,750	$ 518,000	$ 738,150	$ 6,449,100	$ 101,228,750
Long Term O&M (NPV)	$ 1,392,376	$ -	$ -	$ -	$ -	$ -
Total Water Treatment Cost		$ 64,750	$ 8,250,538	$ 13,707,113	$ 32,686,725	
Total SCA Cost	$ 67,260,988	$ 67,260,988	$ 67,260,988	$ 67,260,988	$ 67,260,988	
Total Option Cost		**$ 67,000,000**	**$ 76,000,000**	**$ 81,000,000**	**$ 100,000,000**	**$ 150,000,000**
Dredging Duration	42 weeks / 2 years					97 wks/4 yrs
10,000,000 CY						
Capital Cost	$ 449,795,321	$ -	$ 11,720,335	$ 21,701,242	$ 39,768,803	$ 325,100,789
Operating Cost	$ 25,772,333	$ 647,500	$ 5,180,000	$ 7,381,500	$ 64,491,000	$ 1,577,598,750
Long Term O&M (NPV)	$ 1,670,018	$ -	$ -	$ -	$ -	$ -
Total Water Treatment Cost		$ 647,500	$ 16,900,335	$ 29,082,742	$ 104,259,803	
Total SCA Cost	$ 477,237,671	$ 477,237,671	$ 477,237,671	$ 477,237,671	$ 477,237,671	
Total Option Cost		**$ 480,000,000**	**$ 490,000,000**	**$ 510,000,000**	**$ 580,000,000**	**$ 1,900,000,000**
Dredging Duration	209 weeks / 7 years					962 wks/35 yrs

TABLE 4.21

DETAILED EVAUATION OF SUPERNATANT WATER TREATMENT OPTIONS FOR ONONDAGA LAKE SEDIMENTS

Evaluation Criteria	**Option 1** **Primary Treatment**	**Option 2** **Enhanced Primary Treatment**	**Option 3** **Enhanced Primary Treatment with Multimedia Filtration**	**Option 4** **Advanced Treatment**	**Option 5** **Enhanced Primary + Organics Removal**
Description	Primary Treatment of the supernatant from the dredge slurry consists of solids removal via gravity settling in a SCA. Treated water would be returned to the lake at the SMU dredging work zone where the water originated. Water quality compliance points would be located outside the SMU dredging containment area.	Enhanced Primary Treatment of the dredge water consists of primary treatment with addition of flocculant and additional fine solids removal in a secondary clarifier or settling basin. Treated water would be returned to the lake at the SMU dredging work zone where the water originated. Water quality compliance points would be located outside the SMU dredging containment area.	This option consists of enhanced primary treatment, as described in Option 2, with multimedia filtration for additional VOC, TSS, and mercury removal from the supernatant. Treated water would be returned to the lake at the SMU dredging work zone where the water originated. Water quality compliance points would be located outside the SMU dredging containment area. .	The Advanced Treatment option consists of enhanced primary treatment, metals precipitation, multimedia filtration, air stripping, and GAC polishing filtration. Treated water would be returned to the lake at a fixed discharge point to be determined during remedial design.	This option consists of enhanced primary treatment, as described in Option 2, with activated carbon adsorption for additional VOC, TSS, and mercury removal from the supernatant. Treated water would be returned to the lake at the SMU dredging work zone where the water originated. Water quality compliance points would be located outside the SMU dredging containment area. .
Overall Protection of Human Health and the Environment	The Primary Treatment option would meet all anticipated end-of-pipe discharge criteria established based on applicable water quality criteria with consideration of a mixing zone consisting of the active dredge area with the exception of mercury. However, the mercury Class B water quality criterion, 0.0007 µg/L, is approximately two orders of magnitude below existing lake background concentrations at 0.010 to 0.013 µg/L. Therefore, this option is considered protective of human health and the environment.	This option would provide additional reductions (to the Primary Treatment option) of total suspended solids and adsorbed constituents. Overall, Option 2 would be protective of human health and the environment.	This option would provide additional reductions (to the Primary Treatment option) of total suspended solids and adsorbed constituents. Overall, Option 2 would be protective of human health and the environment.	The Advanced Treatment option would provide the greatest reduction of organic and metal concentrations in the effluent. Overall, Option 4 is considered protective of human health and the environment.	This option would provide additional reductions (to the Primary Treatment option) of total suspended solids and adsorbed constituents. Overall, Option 2 would be protective of human health and the environment.

TABLE 4.21 (CONTINUED)

DETAILED EVAUATION OF SUPERNATANT WATER TREATMENT OPTIONS FOR ONONDAGA LAKE SEDIMENTS

Evaluation Criteria	Option 1 Primary Treatment	Option 2 Enhanced Primary Treatment	Option 3 Enhanced Primary Treatment with Multimedia Filtration	Option 4 Advanced Treatment	Option 5 Enhanced Primary + Organics Removal
Compliance with ARARs	As described in Appendix C, ARARs and TBCs, this option would comply with chemical-specific, location-specific and action-specific ARARs, with the possible exception of the two most stringent surface water criteria for mercury. Dredged or fill material and dredged return water discharged into waters of the state are generally exempt from SPDES permit requirements [6 NYCRR 750-1.5(a)(7)]. Therefore, the most relevant and appropriate regulations to govern the discharge of treated supernatant water from the SCA after dredging are state and federal CWA Section 404 regulations. The substantive requirements of 33 CFR Parts 320 and 323 and 40 CFR Part 230 would apply to the return water discharge. These requirements may be met by showing that (a) the proposed discharge would fall within the substantive requirements for obtaining a general nationwide permit for dredging or (b) the substantive standards applied to individual dredging permits would be achieved. Additionally, the water discharge would meet the substantive water quality requirements imposed by New York State on entities seeking a dredged material discharge permit under Section 404 of CWA. Thus, an applicant for a water quality certification must demonstrate that the discharge would meet relevant and appropriate effluent limits and water quality standards in 6 NYCRR 608.	This option will comply with the ARARs and TBCs, as described for Option 1.	This option will comply with the ARARs and TBCs, as described for Option 1.	This option will comply with the ARARs and TBCs, as described for Option 1.	This option will comply with the ARARs and TBCs, as described for Option 1.

TABLE 4.21 (CONTINUED)

DETAILED EVAUATION OF SUPERNATANT WATER TREATMENT OPTIONS FOR ONONDAGA LAKE SEDIMENTS

Evaluation Criteria	Option 1 Primary Treatment	Option 2 Enhanced Primary Treatment	Option 3 Enhanced Primary Treatment with Multimedia Filtration	Option 4 Advanced Treatment	Option 5 Enhanced Primary + Organics Removal
Short-Term Effectiveness	Primary Treatment would provide significant reduction total suspended solids in the supernatant. The option would meet all anticipated end-of-pipe discharge criteria established based on applicable water quality criteria with consideration of a mixing zone consisting of the active dredge area with the exception of mercury. However as noted above, the mercury water quality standard is two orders of magnitude below existing lake background concentrations. Any short-term impact on water quality in the dredging work zone would be addressed using resuspension containment controls such as silt curtains.	Enhanced Primary Treatment would further reduce the total suspended solids and adsorbed constituents (from Primary Treatment alone) in the supernatant. Any short-term impact on water quality in the dredging work zone would be addressed using resuspension containment controls such as silt curtains.	Enhanced Primary Treatment with Multimedia Filtration would provide further reductions of organic and metal concentrations (from Primary Treatment alone) in the supernatant. Any short-term impact on water quality in the dredging work zone would be addressed using resuspension containment controls such as silt curtains.	Advanced Treatment of the supernatant would provide the greatest reduction in supernatant concentrations. Any short-term impact on water quality in the dredging work zone would be addressed using resuspension containment controls such as silt curtains.	Enhanced Primary Treatment plus Organics Removal would provide further reductions of organic and metal concentrations (from Primary Treatment alone) in the supernatant. Any short-term impact on water quality in the dredging work zone would be addressed using resuspension containment controls such as silt curtains.
Long-Term Effectiveness and Permanence	The SCA supernatant water return would operate during the remedial implementation and would be decommissioned once the sediment in the SCA has been dewatered. Therefore, the long-term effectiveness and permanence criterion does not apply to the operation of the treatment system. Residual effluent concentrations returned to the lake would be managed as part of the dredging resuspension controls. Long-term effective-ness and permanence associated with any residual concentrations would be addressed by sediment capping, which would be an integral part to the dredging alternative.	The long-term effectiveness and permanence would be the same as Option 1.	The long-term effectiveness and permanence would be the same as Option 1.	The long-term effectiveness and permanence would be the same as Option 1.	The long-term effectiveness and permanence would be the same as Option 1.
Reduction of Toxicity, Mobility, or Volume Through Treatment	Primary treatment in a SCA, Option 1, would reduce toxicity and mobility of constituents in the SCA influent by effectively removing over 90 percent of the total suspended solids and associated contaminant concentrations via gravity settling. Removal efficiencies for benzene and chlorobenzene would be somewhat less than 90 percent. Contaminants removed from the supernatant water would remain permanently contained in the SCA.	Option 2 would reduce toxicity and mobility by removing 98 percent of the total suspended solids and significantly reducing concentrations of chromium, mercury, fluorene, and PCBs remaining in the water after primary treatment. Clarifier solids would be returned to the SCA for permanent containment.	Option 3 further reduces toxicity and mobility of contaminant concentrations in the effluent, especially for the organic compounds and mercury. The volume of treatment residues would increase as a result of treatment under Option 3. Clarifier solids would be returned to the SCA for permanent containment. Multimedia and GAC filter media may be returned to the SCA or may require off-site disposal as hazardous waste depending on contaminant concentrations.	Option 4 provides the greatest reduction of toxicity and mobility of contaminant concen-trations in the effluent. However, volumes of additional treatment residues generated from the advanced treatment system components would increase. Clarifier solids would be returned to the SCA for permanent contain-ment. Multimedia and GAC filter media may be returned to the SCA or may require off-site disposal as hazardous waste depending on contaminant concentrations in the media.	

TABLE 4.21 (CONTINUED)

DETAILED EVAUATION OF SUPERNATANT WATER TREATMENT OPTIONS FOR ONONDAGA LAKE SEDIMENTS

Evaluation Criteria	Option 1 Primary Treatment	Option 2 Enhanced Primary Treatment	Option 3 Enhanced Primary Treatment with Multimedia Filtration	Option 4 Advanced Treatment	Option 5 Enhanced Primary + Organics Removal
Implementability	Option 1 is easily implementable and would consist of return of the supernatant from the SCA to the lake. The return water would be piped from the SCA to the dredge operations at the applicable SMUs. The reliability of the treatment system is dependent on the proper design and operation of the SCA. Regular water quality monitoring at the compliance points outside the dredge work zone would assess the effectiveness of the treatment system.	Option 2 is implementable. Materials and equipment for construction of the enhanced primary treatment system are readily available. The system is reliable and has been used for many years as a component to industrial pretreatment systems. Lake water quality monitoring would be performed at the compliance points outside the dredge work zone to assess the performance and effectiveness of the treatment system.	Option 3 is implementable. Materials and equipment required for construction of the enhanced primary treatment system with multimedia filtration are readily available. When properly maintained and monitored, multimedia filters are reliable and effective for removal of some organic and inorganic constituents. Spent multimedia and GAC filter media may require management and disposal as hazardous waste. Water quality would be monitored at the compliance points in the lake to assess the overall effectiveness of the treatment system.	Option 4 is implementable; however the operation and maintenance requirements for this system would be considerable. Materials, equipment, and controls necessary to construct the advanced treatment system are available. The advanced treatment system consists of several components that are proven and effective technologies for removal of target constituents from water. Significant maintenance of the treatment components would be required to maintain optimum effectiveness. Multimedia and GAC filter media may require management and disposal as hazardous waste. Daily monitoring of the system operations would be required and regular effluent monitoring would be performed to assess treatment system effectiveness.	
Cost	Gravity settling in the SCA provides the primary treatment for Option 1. No additional capital costs are estimated for this option. A summary of costs for the water treatment options is in Table 4.21. Detailed cost estimates are presented in Appendix K, sediment management and water treatment cost estimates.	Costs for Option 2 are based on capital costs for construction of the enhanced primary treatment system and operating costs. The costs for the enhanced primary treatment system over the range of sediment volumes evaluated is presented in Table 4.21 Detailed cost estimates for Option 2 are included in Appendix K, sediment management and water treatment cost estimates.	Option 3 costs are based on capital costs for construction of the treatment system and operating costs. A cost summary is presented in Table 4.21. Detailed costs are found in Appendix K, sediment management and water treatment cost estimates.	Costs for Option 4 are based on capital costs for construction of the advanced treatment system and operating costs. The high operating cost is due largely to the cost of caustic for metals precipitation. Summary costs for Option 4 are presented in Table 4.21. Detailed cost estimates are provided in Appendix K, sediment management and water treatment cost estimates	

TABLE 4.22
SUPERNATANT WATER TREATMENT EVALUATION
ONONDAGA LAKE FS

Chemical Parameter/ Physical Property	Average Influent to the SCA Concentration[1] (µg/L)	Primary Treatment		Enhanced Primary Treatment		Enhanced Primary Treatment Plus Multimedia Filtration		Advanced Treatment		Enhanced Primary + Organics Removal	Average Dredge Zone Water Column Concentration[3] (Dredging Impact + Enhanced Primary SCA Effluent) (µg/L)	Class B WQ Standards (µg/L)	Sampled Lake Concentration[4] (µg/L)
		Projected Removal Efficiency	Estimated Effluent Concentration[1] (µg/L)	Projected Incremental Removal Efficiency[2]	Estimated Effluent Concentration[4] (µg/L)	Projected Incremental Removal Efficiency[2]	Estimated Effluent Concentration[1] (µg/L)	Projected Incremental Removal Efficiency[2]	Estimated Effluent Concentration[1] (µg/L)	Estimated Effluent Concentration[1] (µg/L)			
Benzene	220	13%	190	23%	147	0%	147	99%	0.9	12	0.5	10	3.2 (2)/NM
Benzo[a]pyrene	61	100%	0.09	0%	0.09	50%	0.0	0%	0.0	0.09	0.0	0.0012 (GV)	ND
Chlorobenzene	4,100	49%	2111	0%	2111	0%	2111	100%	3.2	42	7.7	5	6.3 (2)/NM
Dichlorobenzenes (sum)	4,900	82%	883	42%	515	6%	486	99%	3.5	32	2.0	5	0.8
Ethylbenzene	200	52%	96	84%	15	6%	14	71%	4.2	7	0.1	17 (GV)	ND/NM
Fluorene	130	96.7%	4.2	99%	0.04	0%	0.04	99%	0.0	0.0	0.0	0.54 (GV)	NM/NM
Hexachlorobenzene	44	99.9%	0.1	0%	0.06	0%	0.06	38%	0.0	0.06	0.0	0	NM/NM
Naphthalene	4,200	82%	763	38%	473	0%	473	89%	53.6	128	1.9	13 (GV)	NM/NM
Phenanthrene	200	99.7%	0.5	1%	0.5	85%	0.1	99%	0.0	0.0	0.0	5 (GV)	NM/NM
Phenol	130	16%	109	37%	69	30%	48	74%	12.5	27	0.2	5	NM/NM
PCBs	180	99.9%	0.3	21%	0.2	0%	0.2	0%	0.2	0.2	0.0	10^{-6}	NM/NM
Pyrene	110	100%	0.4	1%	0.4	99%	0.0	82%	0.0	0.1	0.0	4.6 (GV)	NM/NM
Toluene	420	48%	217	1%	156	8%	144	100%	0.0	3	0.6	6000/100 (GV)	0.16 (1)/NM
Trichlorobenzenes (sum)	590	97%	17	17%	14	36%	9	73%	2.4	5.6	0.1	5	NM/NM
Xylene (sum)	2,900	73%	775	1%	768	0%	768	99%	4.1	115	2.8	65 (GV)	0.4(2)/NM
Mercury, total	1,600	99.7%	4.2	57%	1.81	19%	1.5	41%	0.9	1.1	0.07	0.0007	0.010/0.013
TSS (mg/l)	100,000	99.9%	100	98%	2	50%	1	0%	1.0	2	11	No Impairment	2 to 5

GV = Guidance Value   ND = Not Detected   NM = Not Measured

Notes:

1. Influent and treated supernatant water concentrations estimates taken from a Dredging Workbook for SMU 1, 0-1m dredge cut, average concentrations. Effluent concentrations for Enhanced Primary + Organics removal treatment calculated separately.
2. Incremental removal efficiencies represent the additional removal (above the previous treatment level) resulting from implementing the specific level of treatment. Treatment efficiencies are based on typical unit process removal efficiencies published in USEPA's National Risk Management Research. Laboratory (NRMRL) treatability database (USEPA, 1993b).
3. Modeled water column concentrations taken from workbook cited in Note 1. Concentration based on 45 ac dredge area within SMU1. Concentration includes both dredging impacts and return of Enhanced Primary Treatment (Option 2) level effluent from SCA. Note the calculated concentrations do not include anthropogenic background levels.
4. Average detected water concentrations from TAMS, 2002 (Tables G1-64 and G1-65 in the Onondaga Lake RI) for water depths less than 9 meters/more than 9 meters. Listing of one value represents average lakewide water quality from 12 samples analyzed. Number in parentheses following concentrations are number of detects from the 12 samples analyzed.