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Phase 2 Final Design Report for 2013

Hudson River PCBs Superfund Site

Revised April 2013

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Hudson River PCBs Superfund Site

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1. Introduction

This Phase 2 Final Design Report for 2013 (2013 FDR), prepared on behalf of the General Electric Company (GE), presents the final design for the third year of Phase 2 dredging, to be conducted in 2013 (referred to herein as Phase 2, Year 3) as part of the dredging remedy selected by the United States Environmental Protection Agency (EPA) to address polychlorinated biphenyls (PCBs) in sediments of the Upper Hudson River (the river) located in New York State. That remedy was set forth in a Record of Decision (ROD) issued by EPA for this site in 2002 (EPA 2002). This 2013 FDR constitutes a revised version of the 2013 FDR initially submitted on February 14, 2013 and reflects comments from and discussions with EPA regarding that initial version.

In 2003, GE and EPA executed an Administrative Order on Consent for Hudson River Remedial Design and Cost Recovery (RD AOC), effective August 18, 2003 (Index No. CERCLA-02-2003-2027; EPA/GE 2003); and GE and the United States executed a Remedial Action Consent Decree (RA CD) for the remedy at this site, which was approved by the U.S. District Court for the Northern District of New York in October 2005 (Civil Action No. 1:05-CV-1270; EPA/GE 2005) and modified the RA CD in March 2009 and August 2011.

As described in those documents and discussed further below, the ROD called for implementation of the remedy in two phases. Phase 1 was conducted in 2009. In accordance with the RA CD, following a peer review process, GE elected to perform Phase 2 under the RA CD. The final design for the first year of Phase 2 dredging (referred to as Phase 2, Year 1) was described in the Phase 2 Final Design Report for 2011 (2011 FDR; ARCADIS 2011), which was approved by EPA on April 26, 2011; and Phase 2, Year 1 dredging operations were conducted in 2011. The final design for the second year of Phase 2 dredging (referred to as Phase 2, Year 2) was described in the Phase 2 Final Design Report for 2012 (2012 FDR; ARCADIS 2012a), which was approved by EPA on May 3, 2012, and in Addendum No. 1 – West Griffin Island Area (2012 FDR Addendum 1; ARCADIS 2012b), which was approved by EPA in October 2012. Phase 2, Year 2 dredging operations were conducted in 2012.

Many of the design elements presented in the 2012 FDR and implemented in Phase 2, Year 2 are applicable to the Phase 2, Year 3 dredging project and are not repeated in this design report. Instead, this report focuses on elements of the design that are specific to the Phase 2, Year 3 dredging operations or that differ from the design approach presented in the 2012 FDR.

This report includes the design for dredging in the main stem of the river associated with Certification Unit (CU) 49 and CU55 through CU60 in Reach 8 of River Section 1 and CU67 through CU78 in Reach 6 of River Section 2. This report also presents the design for habitat construction planting activities planned for 2013 associated with CU10 and CU20 through CU29 in Reach 8. The final designs for the remainder of Phase 2 will be submitted to EPA in separate design reports or design addenda.

Figure 1-1 shows the Upper Hudson River and the locations of each lock, dam, reach of river, and designated river section. Figure 1-2 shows the locations of CU49, CU55 through CU60, and CU67 through CU78 in relation to the previously dredged areas, Lock 7, Lock 6, the sediment processing facility, and other project support areas (the Work Support Marina, Moreau Barge Loading Area, and General Support Property). Figure 1-3 shows CU49 and CU55 through CU60, which are located in Reach 8 of the Upper Hudson River; and Figure 1-4 shows CU67 through CU78, which are located in Reach 6. Figure 1-5 shows the CUs targeted for planting in 2013 (CU10 and CU20 through CU29).

This 2013 FDR has been prepared pursuant to the RD AOC and in accordance with the Remedial Design Work Plan (RD Work Plan; Blasland, Bouck & Lee, Inc. [BBL] 2003a), which is an attachment to the RD AOC. It builds upon GE's Preliminary Design Report (PDR; BBL 2004), the Phase 2 Intermediate Design Report (Phase 2 IDR; ARCADIS 2008), the 2011 FDR, and the 2012 FDR.

This report has also been developed to be consistent with the RA CD. The RA CD includes, as Appendix B, a Statement of Work for Remedial Action and Operations, Maintenance, and Monitoring (SOW), which sets forth general requirements for the remedial action and includes several attachments specifying requirements for various aspects of the remedial action. In December 2010, EPA issued revised versions of the SOW (EPA 2010c) and its attachments for Phase 2. The revised attachments to the SOW include the following:

- Attachment A: Critical Phase 2 Design Elements (Phase 2 CDE)
- Attachment B: Phase 2 Remedial Action Monitoring Scope (Phase 2 RAM Scope)
- Attachment C: Phase 2 Performance Standards Compliance Plan Scope (Phase 2 PSCP Scope)

- Attachment D: Phase 2 Remedial Action Community Health and Safety Program Scope (Phase 2 CHASP Scope)

- Attachment E: Operation, Maintenance, and Monitoring Scope for Phase 2 of the Remedial Action (Phase 2 OMM Scope)

- Attachment F: Certification Unit Completion Approval/Certification Forms for Phase 2 (Phase 2 CU Certification Forms)

This 2013 FDR also references, where appropriate, other documents that have been or are being submitted separately to EPA, including:

- The Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2013 (2013 RAWP; Parsons 2013a), and several appendices thereto – namely:

  - Appendix A: Phase 2 Dredging Construction Quality Control/Quality Assurance Plan for 2013 (2013 DQAP; Parsons 2013b);

  - Appendix B: Phase 2 Facility Operations and Maintenance Plan for 2013 (2013 Facility O&M Plan; Parsons 2013c);

  - Appendix C: Phase 2 Transportation and Disposal Plan for 2013 (2013 TDP; Parsons 2013d);

  - Appendix D: Phase 2 Performance Standards Compliance Plan for 2013 (2013 PSCP; GE 2013);

  - Appendix E: Phase 2 Property Access Plan for 2013 (2013 PAP; Parsons 2013e); and

  - Appendix F: Phase 2 Community Health and Safety Plan for 2013 (2013 CHASP; Parsons 2013f).

- Phase 2 Remedial Action Monitoring Quality Assurance Project Plan (Phase 2 RAM QAPP; Anchor QEA 2012)

The 2013 RAWP covers operations related to dredging in CU49 through CU60 and CU67 through CU76. Addenda will be issued to the 2013 RAWP to cover additional CUs if targeted for dredging in 2013.

1.1 Project Setting

The Hudson River is located in eastern New York State and flows approximately 300 miles in a generally southerly direction from its source (Lake Tear-of-the-Clouds in the Adirondack Mountains) to the Battery located in New York City at the tip of Manhattan Island. The ROD issued by EPA calls for a remedial action to remove and dispose of PCB-containing sediments meeting certain criteria for mass per unit area (MPA) of PCBs and surface PCB concentrations or characteristics from the Upper Hudson River (i.e., the section of river upstream of the Federal Dam at Troy, New York).

EPA defined three sections of the Upper Hudson River for the sediment remediation activities outlined in the ROD. The location of each river section is identified on Figure 1-1 and described below.

- *River Section 1*: Former location of the Fort Edward Dam to the Thompson Island Dam (from river mile [RM] 194.8 to RM 188.5; approximately 6.3 river miles)

- *River Section 2*: Thompson Island Dam to the Northumberland Dam (from RM 188.5 to RM 183.4; approximately 5.1 river miles)

- *River Section 3*: Northumberland Dam to the Federal Dam at Troy (from RM 183.4 to RM 153.9; approximately 29.5 river miles)

The environmental history of the Hudson River PCBs Site has been well documented in previous reports and is not reiterated in this 2013 FDR.

1.2 Remedial Action Summary

The remedy selected by EPA is described in the ROD. The remedial action components are described in further detail in the RD Work Plan, PDR, and RA CD, including their attachments.

The ROD calls for the removal of sediment from the Upper Hudson River based on criteria that vary by river section. In particular, the ROD specifies the following criteria:

- In River Section 1, removal of sediments based primarily on an MPA of 3 grams per square meter (g/m^2) or greater of PCBs with three or more chlorine atoms (Tri+ PCBs)

- In River Section 2, removal of sediments based primarily on an MPA of 10 g/m^2 or greater Tri+ PCBs

- In River Section 3, removal of selected sediments with high concentrations of PCBs and high erosion potential (New York State Department of Environmental Conservation [NYSDEC] Hot Spots 36, 37, and the southern portion of 39)

The sediment removal criteria, including those based on surface sediment concentrations of Tri+ PCBs, were further specified in EPA's decision in the dispute resolution proceeding on GE's initial Phase 1 Dredge Area Delineation Report (Phase 1 DAD Report; QEA 2005), which EPA issued in July 2004 (EPA 2004c).

EPA developed performance standards for both the engineering aspects of the project and quality of life considerations. The Hudson River Engineering Performance Standards (EPS; EPA 2004a, EPA 2010b) cover resuspension during dredging and other in-river activities (Resuspension Standard), concentrations of residual PCBs in surface sediments after dredging (Residuals Standard), and productivity (Productivity Standard). The Quality of Life Performance Standards (QoLPS) address project-related impacts on air quality, odor, noise, lighting, and river navigation (EPA 2004b).

As noted above, the ROD called for dredging in two distinct phases: Phase 1 and Phase 2. The Final Design for Phase 1 was described in the Phase 1 Final Design Report (Phase 1 FDR; BBL 2006), approved by EPA on January 25, 2008. Phase 1 dredging operations were conducted in 2009 and included dredging, processing, and disposal of approximately 286,000 cubic yards (cy) of sediment from CU01 through CU08, CU17, and CU18 in Reach 8 of River Section 1.

Following the completion of Phase 1 dredging, EPA and GE prepared Phase 1 Evaluation Reports, which included their respective evaluations of the Phase 1 dredging operations with regard to the Hudson River EPS (Anchor QEA and ARCADIS 2010; EPA 2010a). An independent Peer Review Panel reviewed and evaluated those reports and supporting information provided by GE and EPA, and issued a final report summarizing their findings and recommending changes to the EPS for Phase 2 (Bridges et al. 2010).

On December 17, 2010, EPA issued its decision regarding the requirements for Phase 2, outlined in the following documents:

- Revised Engineering Performance Standards for Phase 2 (Phase 2 EPS; EPA 2010b)
- Technical Memorandum – Quality of Life Performance Standards – Phase 2 Changes (Ecology & Environment [E&E] 2010)
- Revised SOW (Appendix B to the RA CD) and its attachments (EPA 2010c) (described above)

On December 31, 2010, GE formally notified EPA of GE's decision to implement Phase 2 of the project under the RA CD.

As noted above, Phase 2, Year 1 dredging operations were conducted in 2011 in accordance with the 2011 FDR and the Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2011 (2011 RAWP; Parsons 2011) and its appendices. These operations included dredging, processing, and off-site disposal of approximately 363,000 cy of sediment from CU09 through CU16 and CU19 through CU25 in Reach 8 of River Section 1.

Phase 2, Year 2 dredging operations were conducted in 2012 in accordance with the 2012 FDR, 2012 FDR Addendum 1, and the Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2012 (2012 RAWP; Parsons 2012a) and its addenda. These operations included dredging, processing, and off-site disposal of approximately 663,000 cy of sediment from CU26 through CU48 and CU50 through CU54 in Reach 8 of River Section 1. As described in the 2012 FDR Addendum 1, dredging in the West Griffin Island Area (WGIA; CU50 through CU54) commenced in 2012. In 2013, dredging and backfilling operations will be completed in the WGIA concurrent with Phase 2, Year 3 dredging operations in the main stem of the river.

1.3 Adaptive Response Process

Section 7 of the revised SOW provides that EPA will apply an adaptive response approach to review and, as appropriate, modify the Phase 2 EPS; the QoLPS; the Phase 2 remedial design; and monitoring, operational, and other planning documents. The stated objectives of the adaptive response approach are to maintain or improve the efficiency of the project, mitigate short-term impacts as needed, and help ensure that the ROD remedy is successfully completed, that the work remains consistent with the ROD, and that the targets and objectives set forth in the ROD are met.

In 2012, EPA and GE agreed on a number of adaptive response changes for Phase 2, Year 2 (see EPA 2012). Those changes were incorporated into the 2012 FDR, the 2012 RAWP, and other related documents and will be carried forward into Phase 2, Year 3 (unless further modified by agreement of the parties).

In January and February 2013, GE and EPA met to review and discuss potential adaptive response changes that may be appropriate for Phase 2, Year 3. GE's proposed changes that relate to the final design for Phase 2, Year 3 are incorporated into Sections 3 and 4 of this 2013 FDR. Changes relating to operational issues and/or monitoring issues are or will be addressed in other documents.

1.4 Completion of Phase 2 Design

This 2013 FDR includes design information, drawings, and specifications for dredging operations (Contract 42A) associated with Phase 2, Year 3. The design for dredging operations presented in this 2013 FDR applies to CU49, CU55 through CU60, and CU67 through CU78. The design for CU49 was originally approved as part of the 2012 FDR; however, dredging operations were not performed in CU49, and so CU49 has been incorporated into the design for Phase 2, Year 3. Details related to the Phase 2, Year 3 design for dredging operations are described in Section 3. The design for the WGIA (CU50 through CU54), at which dredging began in 2012 and will be completed in 2013, was addressed in the approved 2012 FDR Addendum 1. The final design for dredging associated with the remainder of Phase 2 (CU61 through CU66 [Reach 7 – the Landlocked Area] and CU79 through CU100 [Reaches 1 through 5]), including other CUs that may be targeted for dredging during Phase 2, Year 3, will be submitted to EPA in separate design reports or design addenda.

The conceptual design for habitat construction planting areas for those CUs targeted for dredging in Phase 2, Year 3 (CU49, CU55 through CU60, and CU67 through CU78) is described in Section 3.7 and presented in Attachment C. The final habitat construction design for the Phase 2, Year 3 dredge areas will depend on the conditions after dredging operations are completed in these CUs. Drawings and specifications associated with the final habitat construction design for these CUs will be provided to EPA in separate design submittals. These habitat construction activities will be performed in subsequent years.

This report also presents design information, drawings, and specifications for habitat planting and plant supply planned for 2013. The design for the 2013 planting operations presented in this 2013 FDR applies to CU10 and CU20 through CU29. Details related to the design for 2013 planting operations are described in Section 4 and presented in Appendices 3 and 4.

The processing facility operations (Contract 30) and rail yard operations (Contract 60) will be conducted under the same contracts that were issued with the approved 2011 FDR and revised in 2012 for the work implemented during those 2 years. Consequently, specifications for processing facility operations and rail yard operations are not presented with this design report.

1.5 Report Organization

The 2013 FDR is organized into the sections shown in Table 1-1 below.

Table 1-1 2013 FDR Organization

Section	Description
Section 1: Introduction	Summarizes the remedial action selected by EPA, describes the project setting, discusses the purpose and scope of this 2013 FDR, and discusses completion of the Phase 2 design.
Section 2: Design Supporting Information – Phase 2, Year 3	Summarizes information used to support the design for Phase 2, Year 3 dredging operations.
Section 3: Design Summary – Phase 2, Year 3	Summarizes the design for Phase 2, Year 3 dredging operations and the habitat construction design associated with the Phase 2, Year 3 dredge areas.
Section 4: 2013 Habitat Construction Planting	Presents the design for 2013 habitat construction planting areas.
Section 5: Contract Summary and Remedial Action Implementation – Phase 2, Year 3	Summarizes the contracts for implementing the dredging operations and related activities for Phase 2, Year 3 and the 2013 habitat construction planting, describes the remedial action submittals for that work, and references the schedule for implementation of the remedial action activities in Phase 2, Year 3.
Section 6: References	Provides a list of references cited in this 2013 FDR.
Section 7: Acronyms and Abbreviations	Provides the definitions of acronyms and abbreviations used in this 2013 FDR.
Tables	Provides the tables referenced in this 2013 FDR.
Figures	Provides the figures referenced in this 2013 FDR.
Attachments	Provides the attachments referenced in this 2013 FDR.
Appendices	Provides the drawings and specifications for the dredging operations and habitat construction planting operations for Phase 2, Year 3 activities.

2. Design Supporting Information – Phase 2, Year 3

This section summarizes the Phase 2 performance requirements and discusses design support activities (e.g., engineering data) associated with the design for dredge areas targeted for Phase 2, Year 3. Much of the design supporting information described in the 2012 FDR applies to the design for dredging targeted as part of Phase 2, Year 3 and is not repeated in this design report. Instead, this addendum focuses on elements of the design specific to Phase 2, Year 3 or that differ from the design information presented in the 2012 FDR.

2.1 Phase 2 Performance Requirements

Performance requirements guide the design presented in this 2013 FDR and provide a foundation for the basis of design. The performance requirements include elements from the ROD, Phase 2 EPS, Substantive Phase 2 Water Quality Requirements (Phase 2 WQ Requirements), and QoLPS.

2.1.1 Record of Decision Requirements

The ROD outlines many project-related requirements that serve as a basis for the Phase 2 Design. The major project elements defined in the ROD are summarized in the 2012 FDR and are not repeated in this report.

2.1.2 Engineering Performance Standards

As previously noted, the Phase 2 EPS consist of a Resuspension Performance Standard, a Residuals Performance Standard, and a Productivity Performance Standard. These standards are set out in a document titled Hudson River PCBs Superfund Site – Revised Engineering Performance Standards for Phase 2, issued by EPA in December 2010 (EPA 2010b). The Phase 2 EPS, as they apply to the Phase 2 Design, are summarized in the 2012 FDR and the 2013 PSCP and are not repeated in this report.

2.1.3 Quality of Life Performance Standards

The Phase 2 QoLPS consist of performance standards applicable to air quality, odor, noise, lighting, and navigation. These standards are described in the Hudson River PCBs Superfund Site Quality of Life Performance Standards, issued by EPA in May 2004 (EPA 2004b), as modified by a memorandum titled Quality of Life Performance

Standards – Phase 2 Changes, issued by EPA in December 2010 (E&E 2010), and the revised SOW attachments identified in Section 1. These standards, as so modified, are collectively cited as the Phase 2 QoLPS. The Phase 2 QoLPS, as they apply to the Phase 2 Design, are summarized in the 2012 FDR and the 2013 PSCP and are not repeated in this report.

2.1.4 Phase 2 Water Quality Requirements

The Phase 2 WQ Requirements (including turbidity requirements) applicable to Phase 2, Year 3 are described in the 2013 PSCP and are not repeated in this report.

2.1.5 Monitoring and Reporting

The monitoring programs that GE will conduct during 2013 to meet the requirements of the Phase 2 EPS, Phase 2 QoLPS, and Phase 2 WQ Requirements are described in the Phase 2 RAM QAPP (Anchor QEA 2012). Specific actions that will be taken to address exceedance of the criteria in the Phase 2 EPS, Phase 2 QoLPS, and Phase 2 WQ Requirements and associated reporting requirements are identified in the 2013 PSCP (GE 2013).

2.2 Summary of Phase 2 Design Support Activities

This subsection summarizes design support activities that support the remedial design for Phase 2, Year 3. As noted above, design supporting information described in the 2012 FDR is not repeated in this design report.

2.2.1 Sediment Sampling and Analysis Program and Supplemental Engineering Data Collection Program

The physical and chemical characteristics of the river sediment samples collected in both the Sediment Sampling and Analysis Program (SSAP) and Supplemental Engineering Data Collection (SEDC) Program were used to develop the design for Phase 2, Year 3.

The SSAP was initiated in October 2002, pursuant to the Administrative Order on Consent for Hudson River Sediment Sampling (Sediment Sampling AOC), effective July 26, 2002 (Index No. CERCLA-02-2002-2023; EPA/GE 2002). Additional sediment sampling for dredge area delineation was performed under the RD AOC, and was included under the SEDC program. The results of the sampling activities were used to develop the Phase 1 DAD Report (QEA 2005) and the Phase 2 DAD Report (QEA 2007). The DAD Reports identified the dredge areas and quantified the volume and PCB mass targeted for removal. The delineation was based on criteria set by EPA for each river section. Data gap cores identified in the Phase 2 DAD Report were collected as part of the 2008 data gap sampling program (Anchor QEA and ESI 2009).

SEDC activities have been performed to support development of the remedial design. The objectives of the SEDC Program are to fill engineering data gaps identified during evaluation of the SSAP data. SEDC activities have included infrastructure documentation, debris/obstruction surveys, select geophysical studies (e.g., magnetometer, multi-beam bathymetry, acoustic Doppler [river velocity]), geotechnical studies in certain areas (e.g., test borings, cone penetrometer), and collection of sediment cores to enhance the dredge area delineation. A list of the documents summarizing SEDC activities performed, and the findings of those activities, is included in the 2012 FDR.

Between June and October 2011, supplemental sediment sampling was conducted in CU31 through CU70 to provide additional data for delineating the depth of contamination (DoC). The 2011 sediment sampling activities were conducted in accordance with the Supplemental Engineering Data Collection Work Plan for Sediment Sampling in Certification Units 31-70 (2011 SEDC Work Plan for Sediment Sampling; Anchor QEA and ESI 2011), and the results from the 2011 SEDC sampling program are summarized in the 2011 Supplemental Engineering Data Collection Data Summary Report *(*Anchor QEA and ESI 2012a).

Between May and October 2012, supplemental sediment sampling was conducted in CU71 through CU100 to provide additional data for delineating the DoC. The 2012 sediment sampling activities were conducted in accordance with the 2012 Supplemental Engineering Data Collection Work Plan for Sediment Sampling in Certification Units 71-100 (Anchor QEA and ESI 2012b), and the results from the 2012 SEDC sampling program are summarized in the 2012 Supplemental Engineering Data Collection Data Summary Report *(*Anchor QEA and ESI 2013).

The data generated from the 2011 and 2012 sediment sampling programs were incorporated into the development of dredge prisms, along with previously collected data, to establish the DoC and an associated elevation of contamination (EoC; described in Section 3.1.4 and Attachment A). These data were also used to revise the estimate of PCB mass to be removed from the CUs targeted for dredging in Phase 2, Year 3.

SSAP and SEDC programs are now complete. The results of the sampling activities performed under the SSAP and SEDC programs are included in a database provided to EPA.

2.2.2 Bathymetry Surveys

In 2011 and 2012, GE conducted surveys to gather additional bathymetry and shoreline elevation data in Reach 6 to support the development of the design, update volume calculations, and verify the location of the delineated shoreline (see Section 3.1.2). The 2011 survey activities were conducted by Thew Associates, and the 2012 survey activities were conducted by CLE Engineering, Inc. In Reach 8, data collected by OSI during 2006 bathymetry surveys were used during design (OSI 2007).

The available bathymetry data are used to estimate the sediment surface elevation. The data for various surveys are combined, with priority given to the most recent survey, to create a single surface that covers the areas targeted for dredging, as well as much of the non-dredge areas. Within the CUs, the sediment surface elevations have primarily been set using 2006 multi-beam bathymetric data (CU49 and CU55 through CU60), 2011 multi-beam bathymetric data (CU67 through CU70), and 2012 multi-beam bathymetric data (CU71 through CU78). These data have been supplemented using 2003 single-beam bathymetry data where gaps in the available multi-beam data occur and within the non-dredge areas. For a majority of the non-dredge areas, the sediment surface elevation was estimated using hand-drawn contours developed by OSI based on 2003 single-beam data.

The updated bathymetry surfaces for Reach 8 (for the southern portion of Thompson Island Pool [TIP]) and Reach 6 are provided on the CD-ROM included with this report.

2.2.3 Habitat Delineation and Habitat Assessment

Habitat delineation and habitat assessment were conducted in support of the project design to document the nature and distribution of habitats potentially affected by remediation, and to identify reference habitat locations that represent the distribution of existing conditions and that are not likely to be affected by remediation. The habitat delineation and habitat assessment information relating to Phase 2 areas was presented in the Habitat Delineation Report (HD Report; BBL & Exponent 2006) and the Habitat Assessment Report for Phase 2 Areas (Phase 2 HA Report; Anchor QEA 2009).

For the Phase 2 design, the Upper Hudson River was delineated into four different habitat types: unconsolidated river bottom, aquatic vegetation bed (submerged aquatic vegetation [SAV]), shoreline, and riverine fringing wetlands (RFW), as described in the Habitat Delineation and Assessment Work Plan (HDA Work Plan; BBL 2003b), which is an attachment to the RD AOC. Data were collected in Phase 2 areas from all four habitat types and used to develop the habitat construction design. Detailed habitat maps are included in the HD Report. The results of the detailed habitat assessment of Phase 2 areas are presented and discussed in the Phase 2 HA Report, which was approved by EPA on July 24, 2009.

Subsequent to the approval of the Phase 2 HA Report, formal delineations were conducted for wetlands in Phase 2 areas. The wetland delineation sheets, figures depicting the wetland locations, and brief descriptions of each wetland were provided in the Wetland Delineation Report for Phase 2 Areas (Anchor QEA 2011). As requested by EPA and discussed in the 2011 FDR and the 2012 FDR, wetland boundaries for RFW areas in River Sections 2 and 3 are to be re-checked in the year before dredging is planned.

As described in Attachment C, wetland boundaries were re-checked in 2012 for CU67 through CU78. No discernible differences in the extent of the wetland vegetation or changes in species composition were observed. As such, the existing wetland boundary delineations (Anchor QEA 2011) were used as the basis for defining wetland construction areas. GE will coordinate with EPA prior to additional verification of RFW boundaries for Reaches 1 through 5.

2.2.4 Biological Assessment and Concurrence by Resource Agencies

In January 2006, E&E completed the Final Biological Assessment (BA; E&E 2006) on behalf of EPA. The primary purpose of the Final BA (developed after a review of comments received on a May 2005 draft) was to evaluate the potential direct, indirect, and cumulative impacts of the remedial action on two threatened and endangered species identified as potentially present in the project area – the bald eagle and the shortnose sturgeon – and where deemed appropriate to specify conservation measures designed to minimize impacts on those species. The overall conclusion of the Final BA was that the project "may affect, but is not likely to adversely affect," the bald eagle or the shortnose sturgeon. A detailed description of the BA is presented in the Phase 2 IDR and is not repeated in this report. Specific components of the BA relevant to Phase 2 are summarized in Section 2.2.7 of the 2012 FDR and are applicable to 2013. As indicated in that report, additional bald eagle observations were coordinated with EPA and conducted within Phase 2 dredge areas in the winter of 2012 and 2013 and spring of 2012. No active eagle nests were observed in the vicinity of areas currently targeted for dredging in 2013 (CU49 through CU60 and CU67 through CU78). Similar observations along those portions of the river to be dredged in 2013 will be coordinated with EPA and conducted in spring of 2013. EPA is currently in the process of updating the BA. Components of the revised BA relevant to Phase 2 will be discussed in a separate submittal.

2.2.5 Phase 2 Cultural and Archaeological Resources Assessment Program

Archaeological resource assessments have been conducted to document terrestrial and underwater archaeological resources that could be affected during the Phase 2, Year 3 dredging operations. These are summarized in the following documents:

- Archaeological Resources Assessment Report for Phase 2 Dredge Areas (Phase 2 ARA Report; URS 2008)
- Terrestrial Archaeological Survey and Evaluation for the Thompson Island Pool Section of the Phase 2 Dredge Areas (URS 2011a)
- Underwater Remote Sensing Report for Certification Units 31 Through 70 in Phase 2 Remediation of the Hudson River PCBs Superfund Site (URS 2011b)
- End-of-Field Summary: Underwater Archaeological Survey - Evaluation of Remote Sensing Targets for Certification Units 31 Through 58 in Phase 2 Remediation of the Hudson River PCBs Superfund Site (URS 2011c)
- 2011 Underwater Archaeological Resources Survey: Remote Sensing Analysis and Evaluation of Remote Sensing Targets in Certification Units 19 through 60 of the Phase 2 Dredge Areas (URS 2012)
- 2012 Terrestrial Archaeological Survey and Evaluation for the Land Locked and Fort Miller Dam Sections (URS 2013a)
- 2012 Underwater Archaeological Resources Survey: Remote Sensing Analysis and Evaluation of Remote Sensing Targets in Certification Units 60 through 74 of the Phase 2 Dredge Areas (URS 2013b)

Four in-river areas containing one or more archaeological resources have been designated in the areas targeted for dredging during Phase 2, Year 3 based on archaeological resource assessments. The areas that have been designated as sensitive archaeological areas include the following:

- *Prehistoric Archaeological Site A115.06.000667 – Sensitive Archaeological Shoreline GI-E*: located along the east bank of the river adjacent to CU56 and CU57 on the south side of the confluence of Moses Kill. At this location, fieldwork has documented intact prehistoric living surfaces containing both Archaic and Woodland period artifacts. Portions of the shoreline in this area are high and stabilized by vegetation. In some areas along the western margin of the site, the bank edge is above the waterline but with evidence of erosion, and intermittent slumping and scouring of riverbank sediments are visible. Due to the vulnerability of the shoreline in this area, it has been designated as Sensitive Archaeological Shoreline.

- *Timber Crib and Pier Remnant at Lock 6 – Sensitive Archaeological River Bottom:* located near the east bank of the river, just south of Lock 6, and adjacent to the north edge of CU67. In 1909, a line of timber cribs was constructed in the river extending south from the eastern approach wall of the south end of Lock 6, and a decking of heavy timber was constructed on top of the cribs to form a pier or dock where boats could tie up prior to locking through. The cribs and decking were removed sometime prior to 1940, and a portion of the heavy timber decking was apparently dragged toward the shoreline and left there. Remote sensing data and diver inspection identified a 100-foot long section of this 20-foot wide decking fragment partially embedded in the river bottom. The section begins just north of CU67 and extends approximately 30 feet into the CU. This location has been designated as Sensitive Archaeological River Bottom.

- *Stone Crib Remnants North of the Route 4 Bridge – Sensitive Archaeological River Bottom*: located in and adjacent to CU73 through CU75 in the eastern portion of the river north of the Route 4 Bridge. Remote sensing data, navigation charts, and underwater video inspection documented a series of stone crib remnants regularly spaced in a line extending roughly north-south. The first crib remnant is about 850 feet north of the bridge, and there are six more to the north of that, spaced approximately every 200 to 300 feet. The northernmost crib is approximately 2,400 feet north of the bridge. The exact construction date has not yet been determined, but they appear to be late 19^{th}/early 20^{th} century structures built as part of log drives and the timber processing industry. A line of floating timber booms would likely have been connected to the top of each crib, creating a holding area for logs awaiting processing at the paper mill that was located just downstream below the Northumberland Dam. Currently, the crib remnants consist of square piles of large rocks, and some have wooden piles sticking out of them. Cribs 1, 5, and 6 are located within the boundaries of CU73 and CU74; and Cribs 2, 3, 4, and 7 are located within approximately 30 to 50 feet of CU73, CU74, and CU75. These locations have been designated as Sensitive Archaeological River Bottom.

- *Billings Boatyard Archaeological Site A09114.000021 – Sensitive Archaeological Shoreline*: located along the west bank of the river adjacent to CU77. Terrestrial archaeological studies documented the existence of a historic period archaeological site along the west bank of the river just south of the Route 4 Bridge. This site dates to the second half of the 19th century and contains archaeological deposits related to the Jesse Billings' Boatyard, which was one of the major builders of canal boats in New York State in the 19th century. Previous investigations by the New York State Museum indicated that portions of the shoreline contained related features and deposits such as timber remnants and stone walls. Approximately 700 feet of the shoreline of CU77 has been designated as Sensitive Archaeological Shoreline.

Detailed information regarding these sensitive archaeological areas is presented in documents cited above (URS 2013a; URS 2013b).

These sensitive archaeological areas are identified on Figures 2-1, 2-2, 2-3, and 2-4. The potential effects of dredging and backfilling/capping on these resources were evaluated during the remedial design, and measures established to protect these resources are described in Section 3.2.8.

There are three locations within the Phase 2, Year 3 dredge areas where additional archaeological field data may be needed:

- In CU76, preliminary review of topographic maps and navigation charts suggests that one or more stone crib remnants may be located in or adjacent to the CU. More detailed analysis of remote sensing data is underway. If additional crib remnants are identified, they may be designated as Sensitive Archaeological River Bottom similar to the crib remnants in and near CU73 through CU75.

- In CU77, as noted above, previous studies indicated the presence of possible archaeological remains in the shoreline. An in-river field archaeological survey for that location has not yet been completed, but is planned for the spring of 2013. The results of additional surveys could require adjustment to the limits designated as a Sensitive Archaeological Shoreline adjacent to CU77.

- CU78 is located just north of Lock 5 and is partially situated within what was a 19th century turning basin for the Champlain Canal. Neither remote sensing analysis nor underwater field survey has been completed for CU78, but is planned for the spring of 2013. The results of those studies could require modification of the dredging design for that CU.

If any sensitive archaeological shoreline or river bottom areas are identified by the archaeological resource assessments for CU67 and CU73 through CU78 that affect the design for dredging operations, the findings of those archaeological resource assessments will be incorporated into the design and submitted to EPA as a design addendum.

2.2.6 Analysis of Resuspension

Data collected during the past 3 years of dredging (Phase 1; Phase 2, Year 1; and Phase 2, Year 2) indicate that PCB net loads (i.e., the rate at which PCB mass is released to the river as a result of dredging) correlate with the rate at which PCB mass is dredged. However, it is difficult to quantitatively predict PCB net loads and in-river PCB concentrations for future dredging because planned dredging sequence/production rates are subject to change, river flows are not known, and residual PCB concentrations after design cut dredging are uncertain.

Experience from 2011 and 2012 indicates that the best approach to managing resuspension is to continually assess potential dredging rates, river conditions at the time of dredging, and sediment PCB concentrations (including residual concentrations) in the targeted areas during field implementation and to the extent possible, “balance” dredging of high PCB concentration areas with dredging in relatively low PCB concentration areas. This approach of using operational controls was generally applied in 2011 and 2012, and no resuspension exceedances occurred in those years[1]. As

[1] There were no exceedances of the resuspension criteria of 500 nanograms per liter (ng/L) for 5 out of 7 days in 2011 and 2012. There were only four resuspension results in 2012 that were greater than 500 ng/L. Dredging operations were managed in 2012 such that the results greater than 500 ng/L lasted for only 1 day and 3 consecutive days.

such, a revised analysis of the quantitative predictions has not been performed for the 2013 season; however, as in 2011 and 2012, average total PCB concentrations associated with the design cut are included in Attachment D of this 2013 FDR and will be reviewed continually in the field to guide management of operations with respect to resuspension. A description of how resuspension control is considered in the remedial design is further discussed in Section 3.4.

3. Design Summary – Phase 2, Year 3

As noted in Section 1, many of the design elements presented in the 2012 FDR and implemented during Phase 2, Year 2 are applicable to the Phase 2, Year 3 dredging project and are not repeated in this design report. Instead, this report focuses on elements of the design specific to the Phase 2, Year 3 dredging operations or that differ from the design approach presented in the 2012 FDR. In particular, certain components of the dredging design have been revised or updated based on the 2013 adaptive responses (see Section 1.3), experience gained during previous dredging seasons, and location-specific conditions associated with the targeted dredge areas.

The Phase 2 CDE summarizes key decisions affecting critical elements of the design to be included in this FDR and serves as the basis of design for several design issues. Specific basis of design information is also summarized in the following tables:

- Table 3-1 – Basis of Design for Dredging and Dredged Material Transport
- Table 3-2 – Basis of Design for Backfilling/Capping
- Table 3-3 – Basis of Design for Processed Sediment Transportation and Disposal

During 2013, dredging operations will be conducted under Contract 42A, which was previously used for the Phase 2, Year 2 (2012) dredging operations. Eighteen of the Contract 42A specifications (Section 01350, Section 02206, Section 02371, Section 02921, Section 02931, Section 02936, Section 13701, Section 13720, Section 13802, Section 13803, Section 13805, Section 13810, Section 13820, Section 13825, Section 13840, Section 13860, Section 13897, and Section 13898) have been revised to incorporate specific requirements for Phase 2, Year 3 into the design. These revised specifications are provided in Appendix 1. The other Contract 42A specifications issued as part of the approved 2012 FDR or 2012 FDR Addendum 1 have not changed. These will apply to the Phase 2, Year 3 dredging operations, but are not provided with this report. Minor revisions to the other general (Division 1) specifications may be made to incorporate specific requirements for Phase 2, Year 3. Revised versions of these general specifications are not provided with this report and will be reviewed separately with EPA, as appropriate. The Contract 42A specifications that are referenced in this report but have not changed are cited to their source document. Contract 42A dredging (D-series), backfill (B-series), isolation cap (C-series), and existing conditions (G-series) drawings related to CU49, CU55 through CU60, and CU67 through CU78 are provided in Appendix 2. These drawings include new drawings as well as previously issued Contract 42A drawings that have been revised to incorporate specific requirements for Phase 2, Year 3. Other Contract 42A drawings issued with the approved 2012 FDR or 2012 FDR Addendum 1 that have not changed are not provided with this report.

The following subsections summarize elements of the design associated with the Phase 2, Year 3 dredging operations focusing on items specific to the targeted dredging areas or that differ from the design approach presented in the 2012 FDR.

3.1 Dredge Area Limits

The delineated dredge areas have been divided into CUs (CU01 through CU100) that were defined in accordance with guidelines presented in the Residuals Performance Standard (EPA 2004a, 2010b). The sizes of the CUs vary, but are generally approximately 5 acres in size. The initial limits of the Phase 2 CUs were presented in the Phase 2 IDR. A summary of the CUs designed for dredging in Phase 2, Year 3 is provided below.

3.1.1 Dredging Areas Designed for Phase 2, Year 3

As described in Section 1.4, this 2013 FDR includes the dredging operations design for CU49, CU55 through CU60, and CU67 through CU78. These CUs occupy approximately 97 acres. Table 3-4 summarizes the areas and design removal volumes for these CUs. As presented in Table 3-4, the volume of sediment defined by the “EoC surface” (described in Section 3.1.4 and Attachment A) is approximately 365,000 cy for these CUs, exceeding the Phase 2 Productivity Standard, which targets the removal of 350,000 cy per year (EPA 2010b).

The actual CUs, areal extent, and volume of sediment that will be dredged during Phase 2, Year 3 will depend on the necessary amount of re-dredging and several other factors including, but not limited to, the following:

- The pre-construction bathymetric survey elevations measured before dredging begins, which may differ from the existing bathymetry elevations used during development of the dredge prisms;

- The extent of shoreline and in-river structure offsets incorporated into the final construction dredge prism based on field surveys conducted prior to the start of dredging operations in 2013;

- The amount of over-dredging performed to achieve the required elevations within the specified tolerances;

- The extent and elevations of Glacial Lake Albany Clay (GLAC) and bucket refusal areas encountered during the dredging operations;

- The amount of access dredging that may be necessary to provide access to certain dredge areas;

- The amount of stable side slope dredging that may be conducted by the Dredging Contractor (i.e., dredging of slopes outside the shoreline edge of the CU boundaries steeper than those shown in the dredge prism);

- The area and volume of sediment that will be subject to re-dredging based on the residual sampling results compared to the Residuals Performance Standard criteria, as set forth in the 2013 PSCP;

- The productivity of dredging operations in areas with shallow water, limited access, and near dams;

- The extent of operational adjustments (slowdowns, shutdowns, adjustments to dredging sequencing) necessary to comply with the Performance Standards;

- The operational dates for the opening and closing of the Champlain Canal, determined by the New York State Canal Corporation (NYS Canal Corporation);

- The frequency of high river flows or other factors, such as fog, that limit safe and productive dredging;

- The ability to efficiently unload and process dredged material and water transported to the sediment processing facility;

- The ability to transport and dispose of processed material at a rate such that the volume of processed sediments staged at the sediment processing facility at any given time (including at the coarse material staging areas and filter cake staging enclosures) does not exceed 130,000 cy unless otherwise approved by EPA; and

- The rate of backfilling and capping operations and CU closure because dredging (including re-dredging) will need to be terminated in time to allow for completion of backfilling and capping, closure of CUs, and demobilization before the canal closure date in November. The actual end date for dredging in Phase 2, Year 3 will be determined based on field conditions.

3.1.2 Shoreline Definition

As described in previous design reports, the elevation of the shoreline in Reach 8 (the Thompson Island Pool) was initially based on aerial photos taken in the spring of 2002 and represents a river flow of approximately 5,000 cubic feet per second (cfs) at Fort Edward, which corresponds to an elevation of about 119 ft North American Vertical Datum of 1988 (NAVD88). The exact river flow varies depending on the dates and times photos were taken in different parts of the river. In fall 2008, a land survey of the 119 ft shoreline elevation was conducted for Reach 8, and a revised shoreline was defined for River Section 1 areas based on the surveyed location of the 119 ft elevation. This revised 119 ft shoreline has been incorporated into the basis of the design as the horizontal limit of dredging and backfilling for Reach 8.

The shoreline elevation for Reach 6 (the Northumberland Pool) has also been established based on water surface elevations associated with a river flow of 5,000 cfs at the U.S. Geological Survey (USGS) Fort Edward gage. As described in the approved Phase 2 IDR (ARCADIS 2008), the Upper Hudson River hydrodynamic model (Attachment D of the Phase 2 IDR) was used to estimate the water surface elevations in Reaches 1 through 7 corresponding to this flow. As presented in Section 2.3.1.2 of the Phase 2 IDR, the water surface elevation established by the hydrodynamic model for Reach 6 is 102.1 ft (NAVD88). As with Reach 8, the shoreline boundary in Reach 6 was initially digitized from aerial photography, which was based on a river flow of approximately 5,000 cfs in Fort Edward. Survey data collected in 2011/2012 (see Section 2.2.2) were used to adjust the existing shoreline location, where appropriate, to approximate the 102.1 ft shoreline elevation. This revised 102.1 ft shoreline has been incorporated into the basis of the design as the horizontal limit of dredging and backfilling for Reach 6.

An electronic data file of the shoreline coordinates for Reaches 6 and 8 is provided on the CD-ROM included with this report.

3.1.3 Certification Unit Revisions

As part of the final design, the CU boundaries presented in the Phase 2 IDR (ARCADIS 2008) were adjusted for select CUs designed for Phase 2, Year 3. The boundaries for CU58, CU60, CU67, CU73, and CU74 were adjusted based on the results of data gap sampling performed during 2008 and summarized in the Phase 2 Data Gap Data Summary Report (Anchor QEA and ESI 2009). The lateral limits of CU56, CU57, CU72, CU71, and CU73 were also adjusted based on the results of the 2011 and 2012 SEDC sampling, as presented in the 2011 SEDC Data Summary Report (Anchor QEA and ESI 2012a) and the 2012 SEDC Data Summary Report (Anchor QEA and ESI 2013). Figures showing where the footprints of these CUs have been impacted by these sampling programs are provided in Attachment A.

Section 3.1.1.1 of the Phase 2 IDR recommended that certain Phase 2 areas be excluded from dredging based on an assessment of engineering practicality. As proposed in the Phase 2 IDR, Exclusion Areas FMD_05_NK_A and FMD_11_NK-A were removed from the limits of CU72 and CU75, respectively, based on EPA approval.

An electronic data file of the CU boundaries for CU49, CU55 through CU60, and CU67 through CU78 is provided on the CD-ROM included with this report.

3.1.4 Design Dredge Prism Development

The Phase 2 CDE requires that GE develop an EoC surface that defines the elevation which captures the entire PCB inventory and meets the removal criteria within the targeted areas. The EoC surface was developed using primarily chemistry information (i.e., sediment core profiles of PCB concentrations), but sediment type, bathymetry, historical dredging information (when appropriate), probing information, and sub-bottom information (i.e., the existence of GLAC or bedrock) also influenced its development. As described in Attachment A, an initial EoC surface was developed for CU55 through CU60 and CU67 through CU78 to meet the requirements of the Phase 2 CDE. (Note: The EoC and dredge prism for CU49 was presented in the 2012 FDR, which was previously approved by EPA.) In areas dominated by incomplete cores (i.e., cores whose profiles did not reach the 1 milligram per kilogram [mg/kg] total PCB horizon), special considerations were made to account for historical dredging information. The EoC surface was then adjusted for engineering considerations to create the final dredge prisms (described in Attachment B). The dredge prisms for CU49 and CU55 through CU60 in Reach 8 were developed using multi-beam bathymetry surveys conducted in 2006 and 2011, and the dredge prisms for CU67 though CU78 in Reach 6 were developed using multi-beam bathymetry surveys conducted in 2011 and 2012, where available.

In summary, the following analyses were conducted to develop the dredge prisms:

- Incorporation of the 2011 and 2012 data into the sediment sample database, after accounting for changes in the sediment bed elevation between the 2006 bathymetric survey and sediment bed elevations measured during the core collection in 2011;

- Determining the estimated DoC to the 1 mg/kg vertical horizon based on core chemistry data using an interpolator (based on pre-2010 sediment samples);

- Manual adjustments to the interpolated 1 mg/kg surface to account for isolated areas where the interpolation over- or under-predicted the DoC;

- Delineating areas of GLAC where sufficient data on the elevation of GLAC were available;

- In areas of low confidence, using chemistry data in combination with historical information and other ancillary information to develop the EoC surface;

- In areas where the 1 mg/kg interpolator could not be developed due to data coverage, estimating the DoC based on the available chemistry data; and

- Incorporating engineering adjustments such as slopes, shoreline, and structural offsets into the EoC surface to develop the final dredge prisms.

Consistent with the 2012 adaptive responses (EPA 2012), the dredge prism development process included a comparison of the manually adjusted interpolated surface against the manually delineated GLAC surface. In areas where the GLAC surface was shallower than or within 2 inches deeper than the interpolated surface, the GLAC surface was used to set the final EoC surface.

The EoC surface was developed in accordance with Steps 1 through 3 of the dredge prism process specified in the Phase 2 CDE (as summarized in the first six bullets above). The results are presented in Attachment A.

Engineering considerations (the seventh bullet above) incorporated into the EoC surface to develop the final dredge prisms for Phase 2, Year 3 are described in Attachment B.

Table 3-4 summarizes the areas, design cut volumes, and estimated PCB mass for CU49, CU55 through CU60, and CU67 through CU78 based on the EoC surface and the Design Dredge Prism XYZ File.

The electronic EoC and the Design Dredge Prism XYZ files developed by Anchor QEA and Parsons, as well as related files (estimated GLAC elevations, existing bathymetry elevations, polygon file showing the EoC method in each area of the river) are provided on a CD-ROM with this report.

3.2 Dredging and Dredged Material Transport

The dredging and dredged material transport approach to be implemented for Phase 2, Year 3 will be similar to the approach followed during Phase 2, Year 2 (i.e., mechanical dredging, barge transport of dredged materials, and dewatering at the sediment processing facility in Fort Edward, New York). However, there are a few notable differences in Phase 2, Year 3 that will affect these activities. These include the following: dredging will be conducted in multiple river pools; some targeted dredging areas are in close proximity to the locations of dams; sediments dredged in Reach 6 will be transported through Lock 6 and the associated "land-cut" area north of this lock; the dredged material transport routes are longer; there is a smaller percentage of dredging in the navigation channel; and there are more acres of delineated RFW targeted for dredging in 2013 than in previous dredging seasons.

3.2.1 Dredging

Dredging activities are expected to commence in mid-May 2013 after opening of the Champlain Canal – weather and river flow permitting – and continue into October or November. Dredging is expected to occur 24 hours a day, 6 days a week. The seventh day of the week will be reserved for maintenance, make-up time for unplanned project interruptions, and as a contingency to achieve the productivity target.

Shoreline vegetation that overhangs the dredge area will be pruned. Chipped material and logs generated during removal of shoreline vegetation that have not come into contact with river sediment will be managed for re-use or disposal. Pruning of shoreline vegetation will be conducted in accordance with Specification Section 13893 (Removal of Shoreline Vegetation; ARCADIS 2012a).

Consistent with previous dredging seasons and the Phase 2 CDE, dredging in CU49, CU55 through CU60, and CU67 through CU78 will be conducted using multiple mechanical excavator-mounted, hydraulically closing environmental clamshell bucket dredges. Use of mechanical dredge equipment is expected to be the most effective and productive dredging technique for the areas targeted for dredging during Phase 2, Year 3. The number and size of dredges and the type and size of dredge buckets will be identified by the Dredging Contractor and presented in the 2013 RAWP.

The dredging process will involve initial dredging to remove the volume of design inventory sediment identified in the dredge prisms (the “design cut”), and re-dredging (if necessary) in accordance with the Residuals Standard criteria, as specified in the 2013 PSCP.

Based on discussions with EPA, Specification Section 13803 (Dredging; Appendix 1) has been revised to allow dredging to occur simultaneously in additional CUs beyond the “concurrent CU dredging” requirement if approved by the Construction Manager. Any proposed adjustments to the concurrent CU dredging requirement will be submitted to EPA for review and approval. In addition, because dredging in Phase 2, Year 3 will be performed in multiple river pools, and the CUs downriver are more spread out than in up-river areas, Specification Section 13803 (Dredging; Appendix 1) has been revised consistent with the Phase 2 EPS to allow dredging to be performed simultaneously in areas separated by a dam or areas separated by more than 1,000 feet to maintain dredging productivity and efficiency.

Dredging in the main stem of the river will begin in the northern end of the project area (CU49) and will generally proceed downstream in a way that maximizes safety. Dredging in the northern portion of Reach 6 (CU67 through CU70) will also commence early in the season to provide additional time for dredging in these areas and to take advantage of higher surface water elevations anticipated earlier in the season. Dredging in the southern portion of Reach 6 (CU78) may also commence early in the season to provide draft necessary for barges to be loaded with backfill/cap material from the adjacent upland work area near this CU. The proposed dredging sequence and schedule will be described in the 2013 RAWP based on input from the Dredging Contractor.

In accordance with the approved 2012 FDR Addendum 1, dredging was initiated in the WGIA (CU50 through CU54) during 2012, and completed for CU50. In 2013, dredging will be completed in CU51 through CU54 concurrent with dredging in the main stem of the river. Habitat construction for the WGIA is planned for 2014 (the season after dredging is completed).

Debris removal will be performed as part of dredging. In the event that debris cannot be removed with the dredge bucket, the Dredging Contractor will be prepared to use alternate procedures and/or equipment to remove debris as necessary to facilitate dredging to the required elevations.

The extent of dredging required for each dredging pass (the design cut or re-dredging cuts) will be shown in dredge prism files, which include electronic data that specify the horizontal (X and Y) and vertical (Z) extent of material to be removed as part of the dredging pass. The Design Dredge Prism XYZ File will be modified to incorporate offsets from shoreline riprap and in-river structures in accordance with Drawing D-2802 (Appendix 2) based on the results of field probing and surveys conducted prior to dredging. The Design Dredge Prism XYZ File will also be modified to incorporate setbacks proposed by the Dredging Contractor. Such setbacks may be necessary where the Dredging Contractor believes that dredging operations cannot be implemented safely or where the Dredging Contractor believes that dredging operations cannot be implemented without compromising the integrity of public or private structures or utilities located in or along the banks of the river (also see Section 3.2.3 related to work near dams). These proposed setbacks will be submitted to EPA for approval prior to being incorporated into the dredge prisms.

As described in Specification Section 13803 (Dredging; Appendix 1), Construction Dredge Prism XYZ Files will be provided to the Dredging Contractor and will serve as the basis for determining whether dredging has achieved the required elevations.

The dredging tolerance requirements presented in Specification Section 13803 (Dredging; Appendix 1) have not changed from the tolerance requirements implemented during Phase 2, Year 2.

3.2.2 Access to Dredging Areas

Dredging of non-target material may be necessary to provide access to shallow-water dredge areas. Based on preliminary discussions with the Dredging Contractor, access dredging may be necessary in portions of CU60, CU68 through CU70, and CU76 to facilitate access required to perform the work. These areas include shallow water and portions of these CUs have been delineated as RFW. The plan for access dredging in these areas is anticipated to involve the dredging of access lanes at depths below the dredge prism to provide access for the dredging equipment and barges.

Access dredging may also be necessary in other areas. The need for and actual extent of access dredging will be determined by the Dredging Contractor and the Construction Manager and will depend on the dredging approach, schedule, sequence, and field conditions encountered. Any access dredging proposed by the Dredging Contractor will be reviewed by the Construction Manager based on an assessment of the benefit of the proposed access dredging compared to other potential project impacts. Any required backfilling and habitat construction resulting from access dredging areas will be reviewed with EPA prior to dredging those areas.

The Dredging Contractor may also propose to dredge shallow areas early in the season when water elevations are likely to be higher.

3.2.3 Work near Dams

Certain CUs targeted for dredging in Phase 2, Year 3 are in relatively close proximity to existing dams on the river – namely CU60 in Reach 8 near Thompson Island Dam and CU76 and CU77 in Reach 6 near Northumberland Dam. Specification Section 01350 (Health and Safety; Appendix 1) includes establishment of a no-work zone that will extend a minimum of 200 feet upstream of each dam.

Specification Section 01350 also includes requirements for all contractors to develop a Near Dam River Operations Plan. This plan will provide specific details regarding implementation of all work downstream of any dam safety warning cable or signage or within 1,000 feet upstream of any dam. The plan will include an assessment of conditions in the vicinity of the dam, a description of task-specific safety procedures to be implemented during the work, and identification of emergency response procedures. The plan will also require the contractors to delineate a no-work zone in the vicinity of each dam based on safety considerations. The no-work zone may extend more than 200 feet upstream of each dam based on the contractor’s evaluation of required activities, conditions, required equipment, and considering where the contractor believes that their operations cannot be implemented safely. Dredging setbacks associated with the contractors’ proposed no-work zones will be submitted to EPA for approval.

A dredge prism offset from Thompson Island Dam has been incorporated into the Design Dredge Prism XYZ File as detailed in Attachment B based on the 200-foot no-work zone described above. Attachment B includes a figure showing the extent of the 200-foot offset and provides estimates of the sediment volume and PCB mass associated with the offset. Additional dredge prism offsets will be incorporated into the

Construction Dredge Prism XYZ Files if the final approved no-work zones near dams extend beyond the 200-foot no-work zone referenced in Specification Section 01350.

Any further actions related to dam offsets will be discussed between GE and EPA after receipt of all 2013 contractor Near Dam River Operations Plans.

3.2.4 Dredged Material Transport

Sediment and debris dredged during Phase 2, Year 3 will be loaded into hopper barges and transported in the river, through Lock 6 and the land-cut north of the lock (for dredging in Reach 6), and through Lock 7 to the sediment processing facility for unloading and dewatering.

Specification Section 13840 (Transport Procedures Through Canal Locks; Appendix 1) has been revised to include reference to the operation of Lock 6 as necessary during the canal season to support dredging operations (i.e., 24 hours per day, 6 days per week).

In shallow water areas, the use of smaller capacity barges (which require less draft) and/or light-loaded hopper barges is anticipated. Dredged material loaded onto shallow draft barges would be transferred to larger hopper barges prior to transport to the sediment processing facility. The number and sizes of tugs and barges will be determined by the Dredging Contractor and described in the 2013 RAWP.

Similar to previous dredging seasons, an internet-based barge tracking system (referred to as the Barge Electronic Reporting System [BERS]) will be used to document and provide up-to-date information regarding the status of each barge loaded by the Dredging Contractor, and project vessel movements will be monitored, recorded, and coordinated using a vessel traffic service (VTS) center.

The specification requirements for barge loading, in-water transport, lock operations, and marine traffic control are documented in Contract 42A Specification Sections 13803 (Dredging; Appendix 1), 13810 (In-Water Material Transport; Appendix 1), 13840 (Transport Procedures Through Canal Locks; Appendix 1), 13845 (Aids to Navigation During Dredging Operations; ARCADIS 2012a), and 13860 (Marine Traffic Control; Appendix 1).

3.2.5 Anchoring Restrictions

Anchoring will be restricted within areas where SAV or RFW habitat is present outside of dredge areas, in areas where SAV has been planted, in backfilled areas designated as SAV planting areas or natural colonization areas, in backfilled areas designated as RFW, in areas where caps have been placed, and in sensitive archaeological areas. In addition, no anchoring of work-related vessels will be permitted in the navigation channel without approval from EPA in consultation with the NYS Canal Corporation.

The specification requirements for anchoring during dredging operations are documented in Contract 42A Specification Section 13820 (Anchoring during Dredging Operations; Appendix 1) and Contract 53A Specification Section 13821 (Anchoring during Habitat Construction Activities; Appendix 3). The anchoring restrictions are shown on Drawings D-4201 through D-4229 (Appendix 2) and Drawings D-4201 through D-4208 (Appendix 4).

3.2.6 On-River Water Treatment

Although an on-river water treatment system was not implemented in Phase 2, Year 2, it is again being considered for implementation during Phase 2, Year 3 to increase the volume of sediment transported in each barge by reducing the amount of water in the barge and to improve sediment unloading efficiencies and productivity. The barge-mounted system may be deployed to remove and treat excess free water in material transport barges loaded with dredged materials. Performance-based specifications for the design, construction, operation, and maintenance of an on-river water treatment system were presented in the approved 2012 FDR. If GE should decide to implement this on-river system, and if any changes to the specifications appended to the approved 2012 FDR are proposed for that system, revised specifications will be submitted to EPA for review under separate cover.

3.2.7 Dredge Planning

A forecast dredging plan is shown on Figure 3-1 that has been developed based on experience in previous dredge seasons, assumed conditions for the Phase 2, Year 3 dredging season, and with input from the Dredging Contractor for Phase 2, Year 3. The plan depicts the estimated durations for the first and second dredging passes based on the assumptions shown on Figure 3-1. The actual areas to be dredged in Phase 2, Year 3 and the actual dredging sequence will depend on the resources implemented, the effective hours worked, the actual production rates of those resources, and the conditions encountered in the field (see Section 3.1.1). Additional discussion regarding the planned number, productivity, and sequence of project resources implementing the dredging and backfill/capping operations during Phase 2, Year 3 is also provided in the 2013 RAWP documents.

3.2.8 Archaeological Site Protection Measures

For Phase 2, Year 3, two shoreline areas have been designated as Sensitive Archaeological Shorelines, and two in-river areas have been designated as Sensitive Archaeological River Bottoms based on the findings of previous archaeological assessments. Section 2.2.5 provides a summary of these areas. Dredging offsets will be applied in CU56, CU57, and CU77 in the areas designated as Sensitive Archaeological Shorelines. In addition, dredging offsets will be applied in areas designated as Sensitive Archaeological River Bottom in CU67, CU73, and CU74. These areas are shown on the Drawings. Dredge prism offsets that have been incorporated into the Design Dredge Prism XYZ File are described in Attachment B. In addition, archaeological site protection measures will be implemented as described in Section 2.3.1.11 of the 2012 FDR and as described in Specification Section 01353 (Cultural Resources, ARCADIS 2012a).

3.3 Air Mitigation and Sheen Response BMP Areas

Based on the criteria listed in the Phase 2 CDE (and as summarized in Section 2.3.2 of the 2012 FDR), areas with potential to emit PCBs to the air at levels close to or exceeding the air quality standard as part of the design cut dredging pass (referred to as “air mitigation best management practice [BMP] areas”) have been identified based on an evaluation of the average total PCB concentrations in the targeted dredging areas. The Phase 2 CDE also requires that actions be taken to prevent, contain, and clean up oil sheens or evidence of non-aqueous phase liquid (NAPL) observed in the field or when dredging in areas with total PCB concentrations greater than 200 mg/kg.

Specification Section 13803 (Dredging; Appendix 1) describes the air mitigation BMPs. These requirements are unchanged for Phase 2, Year 3.

Specification Section 13871 (Sheen Response During Dredging Operations; ARCADIS 2012a) describes the Dredging Contractor’s requirements to address sheens and NAPL, including requirements for notification and reporting, development of a Sediment Oil Sheen Response Plan, implementation of BMPs, and sheen response actions if sheens are observed. These requirements are also unchanged for Phase 2, Year 3.

The approach for designating air mitigation BMP areas and sheen response BMP areas for Phase 2, Year 3 is described in Attachment D. Figures showing mass-weighted average total PCB concentrations associated with design cut sediment are provided in Attachment D. These figures also show where air mitigation BMP areas and sheen response BMP areas have been identified for the design cut based on this review of the total PCB concentrations. The air mitigation BMP areas and sheen response BMP areas associated with the design cut are also shown on Drawings D-3113 through D-3128 (Appendix 2).

Air mitigation BMP areas and sheen response BMP areas (if any) associated with re-dredging operations will be identified in the field based on the results of residual sampling and the experience gained during the initial dredge pass.

3.4 Resuspension Control

In accordance with the Phase 2 CDE, resuspension control BMPs are to be implemented during all in-river operations. Implementation of contingent resuspension control BMPs may be required if the Control Level for total PCB concentrations or Tri+ PCB net loads (measured as daily percent release) under the Resuspension Standard is exceeded.

3.4.1 Analysis of Resuspension

As discussed in Section 2.2.8, there is significant uncertainty in quantitative predictions of daily PCB concentrations at near-field and far-field stations for future dredging years. In addition, the limitations of the modeling tools (i.e., the logistics model for constructing dredge plans and the PCB fate and transport models used to predict water column concentrations and loads) make the precise prediction of resuspension release during the project difficult if not impossible. While these models can be used as tools to identify potential areas of concern, several factors that cannot be accurately predicted prior to the work, such as river flow, dredging sequence, and dredging rates, will influence the actual resuspension release. This uncertainty makes it difficult to predict the need for in-river or operational controls.

Based on discussions with EPA, the Phase 2, Year 3 dredging and management of resuspension will continue in a manner similar to the approach used in 2011 and 2012.

GE, the Construction Manager, and the Dredging Contractor will assess planned dredging rates and sediment PCB concentrations in the targeted areas and (to the extent possible) "balance" dredging of high PCB concentration areas with concurrent dredging in relatively low PCB concentration areas. This will be done for both the design dredging pass using the *in-situ* design data and any residual passes using residual core information to establish areas of high PCB concentrations. Maps of average PCB concentrations using the design cores will be overlaid with the dredging lanes to determine where and when (based on the proposed dredging sequence) particularly high PCB concentrations may be encountered. In the same way, residual core data will be assessed before re-dredging begins to establish whether a relatively high residual concentration area is going to be dredged.

Near-field and far-field data will be collected to provide a basis for whether the operational controls are effective. If exceedances occur, an analysis will be performed to try to determine what areas and/or specific conditions may have led to the exceedance and if necessary, operational adjustments will be made to prevent future exceedances. If resuspension exceedances continue to occur and BMPs and operational adjustments prove ineffective, GE will meet with EPA to review conditions. Additional analyses may be required to evaluate targeted areas of the river and identify potential adjustments to mitigate future exceedances.

3.4.2 Resuspension Control BMPs

The Dredging Contractor will be required to implement certain resuspension control BMPs during all in-river operations, including, but not limited to, debris removal, dredging, transport of dredged material, vessel movement, and backfill/cap placement. The resuspension control BMPs consist of operational controls to minimize the sediment resuspension and the release of PCBs. Contingent resuspension control BMPs may also be required if there is an exceedance of the Control Level for total PCB concentrations or Tri+ PCB net loads (measured as daily percent release) under the Resuspension Standard. The need for and type of contingent BMPs will be determined in the field based on monitoring data obtained during operations. The routine and contingent resuspension control BMPs are included in Specification Section 13805 (Resuspension Control; Appendix 1). These requirements are unchanged for Phase 2, Year 3, except for updated reference to the 2013 PSCP.

3.4.3 Resuspension Containment Systems

As discussed in the Phase 2 CDE, the use of resuspension containment systems (i.e., silt curtains) during Phase 1 for containing dissolved-phase PCBs was found to be relatively ineffective in the Hudson River. In addition, the Peer Review Panel did not support the use of silt curtains or other physical barriers to control loss of PCB due to resuspension during Phase 2. The Phase 2 CDE indicates that the use of silt curtains to control resuspension will not be required in Phase 2 except in specific circumstances identified either by GE or EPA. GE has not identified any areas where silt curtains or other resuspension control barriers are recommended for Phase 2, Year 3 dredging.

3.5 Sediment Processing, Segregation, and Disposal

3.5.1 Sediment and Water Processing

The sediment processing facility will receive barges and unload dredged sediment from the barges at the waterfront. Dredged material, depending on its consistency, will be unloaded at one of the two unloading stations and fed into the size separation equipment or loaded directly into trucks for transport to the coarse material staging area without processing if the dredged material is free draining. Debris and other large objects will be separated from the sediment, and the sediment will be classified according to particle size into fine and coarse fractions. The fine fraction of the sediment will be thickened, dewatered, and staged for subsequent loading into railcars. The separated coarse fraction will also be staged for subsequent loading into railcars and transportation for disposal. Water from the unloading, screening, and dewatering operations, along with stormwater collected from process areas of the site, will be treated and discharged to the Champlain Canal.

GE has implemented or is currently implementing process improvements and maintenance at the sediment processing facility to increase the reliability and productivity of the system. Information regarding modifications at the sediment processing facility will be provided to EPA under separate cover.

3.5.2 Material Segregation

Dredged sediments and debris will be characterized and managed for transport and disposal in accordance with the 2013 TDP. As described in the 2013 TDP, materials to be disposed of at a facility regulated under the Toxic Substances Control Act (TSCA) will be segregated from materials that may be sent to a non-TSCA solid waste landfill throughout the process of dredging, barge transport, and barge unloading, as well as handling, transfer, and staging of the materials at the processing facility. The resulting materials will then be separately transported to the respective disposal facilities authorized to receive and dispose of such materials, as described in the 2013 TDP.

3.5.3 Waste Transport and Disposal

As in previous dredging seasons, transportation of processed sediment and other project waste material will be by rail using "unit trains". Railcars will be equipped with a sift-proof packaging system in accordance with U.S. Department of Transportation (DOT) requirements**.** Each railcar will be weighed before leaving the processing facility rail yard to verify that the load meets the weight restrictions of the commercial carriers. Once a unit train is filled with processed sediment and other project waste material, it will be picked up by the commercial rail carrier.

Once a train is loaded, the processed materials will be transported by railroad to authorized commercial disposal facilities identified in the 2013 TDP. Upon arrival at the landfill, the railcars will be unloaded and set for the return trip to the sediment processing facility. The unloaded waste material will be disposed of by the landfill operator in accordance with the landfill's operating permits and authorizations.

3.6 Backfill/Cap Placement

After dredging is complete in each CU or CU sub-unit, the dredged areas will be backfilled or capped, as appropriate, to isolate residual sediments and support habitat construction. The total and relative acreages of areas to be capped or backfilled will depend on the results of the residuals sampling and the number of CUs dredged.

The decision to place backfill or cap will be based on the post-dredging distribution of PCB concentrations in accordance with the Phase 2 EPS and 2013 PSCP or as otherwise approved by EPA.

The backfill and cap material specifications for Phase 2, Year 3 are described in Specification Section 02206 (Backfill and Cap Material; Appendix 1). The backfill and cap material placement requirements for Phase 2, Year 3 are described in Specification Section 13720 (Backfill/Capping; Appendix 1).

3.6.1 Backfill/Cap Footprint

Dredged areas will be covered by backfill or cap material, based on residual sample results, except where backfill will not be placed in the navigation channel (as described below). The Phase 2 EPS limit the amount of capping that will be allowed in Phase 2. The capping limits are described in the 2013 PSCP.

Except where there are residual compliant sampling nodes with an average Tri+ PCB concentration exceeding 1 mg/kg (as discussed below), backfill will not be placed in the navigation channel if the post-dredge elevation is above 101.7 ft (NAVD88) in Reach 8 or above 85.2 ft (NAVD88) in Reach 6. These elevations correspond to a 15.5-foot water depth below the crest elevation of the downstream dam (the 14-foot post-backfill placement water depth required by the Phase 2 EPS plus the 12-inch thick backfill layer and the allowable backfill placement tolerance).

In accordance with EPA's 2012 adaptive responses (EPA 2012), at sampling nodes in the navigation channel where the residual Tri+ PCB concentration in the surface sediment after the first dredging pass exceeds 1 mg/kg (after rounding) but does not cause the average Tri+ PCB concentration in the CU to exceed 1 mg/kg or meet the other mandatory conditions for re-dredging as specified in the 2013 PSCP, backfill will be placed so long as there is approximately 12 feet of draft above the post-placement backfill surface at low-pool conditions. This would equate to placing backfill within the NYS Canal Corporation navigation channel so long as the post-backfill surface elevation is anticipated to be 105.2 ft (NAVD88) or lower in Reach 8 and 88.7 ft (NAVD88) or lower in Reach 6.

Areas not dredged due to offsets from riprap and structures will not be covered with backfill or cap material.

3.6.2 Backfill

Consistent with the design for previous dredging seasons, there are four main components of backfill in the design:

- Base backfill layer;
- Near-shore backfill;
- Habitat layer backfill; and

- Backfill in RFW construction areas.

3.6.2.1 Backfill Material Types

The backfill material specifications for Phase 2, Year 3 are described in Specification Section 02206 (Backfill and Cap Material; Appendix 1). The choice of backfill type will be determined as follows:

- Type 1 backfill material will generally be used in locations with estimated surface water velocities of 1.5 feet per second (ft/s) or less during a 2-year flow event (except as noted below), and Type 2 backfill material will be used in areas with estimated surface water velocities greater than 1.5 ft/s during a 2-year flow event.

- Only Type 2 backfill material will be placed in the navigation channel.

- Type 2 backfill material will be used for supporting side slopes associated with the placement of near-shore backfill, habitat layer backfill, and RFW construction areas.

- Type 2 backfill will be designated for use as a base material layer for near-shore backfill and RFW construction areas.

- The upper 1 foot of RFW construction areas will consist of a mixture of Type 2 backfill material and topsoil with a pre-placement total organic carbon (TOC) content between 2 and 5 percent (except as described in Section 3.6.2.5). This material will be referred to as Type 5 backfill material.

Based on backfill placement experience to date, the use of Type 1 backfill will be specified for areas where its geotechnical properties provide for it to be stable enough to maintain the desired river bottom slopes and shape. Areas where Type 2 backfill will be placed in low-velocity areas in lieu of Type 1 backfill have been reviewed with EPA and incorporated into the design in low-velocity areas having a slope steeper than five horizontal to one vertical (5H:1V), nearshore areas adjacent to high-velocity areas or adjacent to slopes steeper than 5H:1V, and in low-velocity areas in close proximity to dams. Additional areas may be identified in the field by the Construction Manager for placement of Type 2 backfill in low-velocity areas in lieu of Type 1 backfill based on an evaluation of slopes of the river bottom after dredging is completed. These areas will be reviewed with EPA prior to backfill placement.

Specification Section 02206 (Backfill and Cap Material; Appendix 1) has been revised to incorporate material requirements for the Type 5 backfill material. This specification has also been revised, consistent with the approach implemented during 2012, to include backfill/cap material testing for Diesel Range Organics and Gasoline Range Organics (DRO/GRO) prior to transport to the project site.

3.6.2.2 Base Backfill Layer

As required by the ROD (EPA 2002), dredged areas will be backfilled with an approximately 1-foot layer of Type 1 or Type 2 material placed on the river bottom following completion of dredging, except in certain locations within the navigation channel as described in Section 3.6.1; except as described in Sections 3.6.2.3, 3.6.2.4, and 3.6.2.5; and except where isolation caps will be placed.

Locations where Type 1 and 2 backfill materials would be applied are identified on Drawings B-2313 through B-2328 (Appendix 2).

3.6.2.3 Near-shore Backfill

In accordance with the Phase 2 CDE (EPA 2010a), near-shore areas will be restored to pre-dredging bathymetry.

In Reach 8, consistent with the design for previous dredging seasons, the near-shore boundary has been established at an elevation of 117.5 ft (NAVD88), which corresponds approximately to the minimum 1-day average flow that occurs once every 3 years (1Q3; flow of 1,100 cfs at the USGS Fort Edward gage).

EPA recommended that the 1Q3 flow event values be used in Phase 2 reaches downstream of Reach 8 if bathymetric data are not available to identify natural breaks in slope in the shoreline areas or if a natural break is not generally found in a given pool (EPA 2006). As described in the Phase 2 IDR, because bathymetric data are not sufficient to identify natural breaks in slopes, the 1Q3 flow event was used as the design basis for establishing the near-shore boundary in Reach 6. The Upper Hudson River hydrodynamic model was used to estimate the corresponding water surface elevation in Reach 6 based on a flow of 1,100 cfs at the Fort Edward gage. However, because the flow-stage rating curve developed for the hydrodynamic model predicts a low-pool elevation that is lower than the crest elevation for the downstream dam, the near-shore elevation in Reach 6 has been established at an elevation of 100.7 ft (NAVD88), which is equal to the crest elevation of the downstream dam.

The near-shore area is defined as the area between the shoreline and the near-shore boundary elevation. Near-shore setpoints were established at intervals of approximately 100 feet, and at points of inflection, along the near-shore boundary contour line based on the 2005/2006 bathymetry survey data in Reach 8 and 2011/2012 bathymetry survey data in Reach 6. The near-shore border extends between the near-shore setpoints to approximate the near-shore boundary bathymetric contour, but is not necessarily at the defined elevation at all locations between the setpoints. In CU77 (Reach 6), the near-shore border was adjusted and does not follow the pre-dredge 100.7 ft bathymetric contour line where it extends into the navigation channel. In this area, the near-shore border was adjusted to provide clearance from the navigation channel. Figures showing the near-shore setpoints and near-shore border relative to the near-shore boundary contour line are provided in Attachment E. An electronic data file of the near-shore boundary is provided on the CD-ROM included with this report.

Near-shore backfill will be placed to original bathymetry in areas between the near-shore border and the shoreline. The upper 1 foot of near-shore backfill material will consist of Type 1 or Type 2 material. Type 2 material will be used below the upper 1 foot of near-shore backfill, as needed. Supporting side slopes of 3:1 (horizontal:vertical) (i.e., the 3:1 near-shore backfill wedge) will be constructed using Type 2 material and will extend from the edge of the near-shore backfill (i.e., at the near-shore border) down to the adjoining 1-foot backfill layer.

Details and example cross-sections for near-shore backfill are shown on B-2122 (Appendix 2). The near-shore border and near-shore setpoints, along with locations where near-shore backfill materials would be applied, are identified on Drawings B-2313 through B-2328 (Appendix 2). The coordinates for the near-shore setpoints are identified on Drawings B-2802 and B-2803 (Appendix 2).

3.6.2.4 Habitat Layer Backfill

In accordance with the Phase 2 CDE, additional backfill (hereafter referred to as “habitat layer backfill”) will be used to reconstruct SAV planting, contingency, and natural recolonization areas in dredged areas where the pre-dredging water depth is less than 8 feet and the water depth after dredging and backfill layer placement will be greater than 8 feet (i.e., an elevation lower than 111 ft [NAVD88] in Reach 8 and lower than 94.1 ft [NAVD88] in Reach 6 after dredging and placement of the backfill layer or isolation caps is completed).

Habitat layer backfill will be placed to either return the area to pre-dredging bathymetry or to a water depth of 5 feet below the shoreline elevation. In areas where habitat layer backfill is required based on the criteria listed in the Phase 2 CDE and described above, backfill material will be placed based on the following:

- In Reach 8, SAV areas with pre-dredging elevations between 111 ft and 114 ft will be returned to pre-dredging bathymetry, and SAV areas with pre-dredging elevation between 114 ft and 117 ft will be returned to an elevation of 114 ft.

- In Reach 6, SAV areas with pre-dredging elevations between 94.1 ft and 97.1 ft will be returned to pre-dredging bathymetry, and SAV areas with pre-dredging elevation between 97.1 ft and 100.1 ft will be returned to an elevation of 97.1 ft.

Conceptual SAV planting, contingency, and natural recolonization areas have been developed for CU49, CU55 through CU60, and CU67 through CU78 as described in Section 3.7 and Attachment C. The conceptual SAV planting, contingency, and natural recolonization areas will serve as the basis for determining the locations and extent of habitat layer backfill placement. The conceptual SAV primary and contingency planting areas and natural recolonization areas associated with CU49, CU55 through CU60, and CU67 through CU78 are shown on Drawings B-2313 through B-2328 (Appendix 2).

After dredging is completed and prior to backfill placement, the Dredging Contractor will be provided with the locations, extents, and elevations for placement of the habitat layer backfill by the Construction Manager. The locations and elevations for placement of habitat layer backfill will be based on the post-dredging elevations in the conceptual SAV planting, contingency, and natural recolonization areas. The decision of whether to place habitat layer backfill will also be based on the proximity to the navigation channel, the locations of isolation caps, and adjustments (if any) to the conceptual habitat construction locations based on post-dredging conditions. The Construction Manager may exclude habitat backfill layer from small areas. The habitat backfill layer designs developed after the completion of dredging, including areas excluded by the Construction Manager, will be reviewed and approved by EPA as part of the CU certification process.

Details and example cross-sections for habitat layer backfill are identified on Drawing B-2124 (Appendix 2). The habitat layer backfill will consist of Type 1 or Type 2 material. Supporting side slopes of 3:1 (horizontal:vertical) constructed using Type 2 material will be created extending from the edge of the habitat layer backfill down to the adjoining backfill surface. Habitat layer backfill will be placed above caps (where caps are placed in areas to receive habitat layer backfill) and may be placed above the 3:1 supporting side slopes for near-shore backfill.

Based on the analysis summarized in Attachment C, an estimated volume of approximately 18,200 cy of habitat layer backfill would be placed in CU49, CU55 through CU60, and CU67 through CU78, assuming dredging to an elevation 12 inches below the EoC surface. This volume does not include the backfill that would need to be placed due to dredging (including residual dredging) deeper than 12 inches below the EoC surface or placement of the supporting 3:1 side slopes. The areas receiving habitat layer backfill and the total volume placed in Phase 2, Year 3 will be determined during the CU certification process.

3.6.2.5 Riverine Fringing Wetland Construction Areas

Approximately 14.8 acres of RFW have been delineated in CU49, CU55 through CU60, and CU67 through CU78. As described in Attachment C, RFW areas disturbed during the dredging operations will be restored at their current locations as delineated in the Wetland Delineation Report for Phase 2 Areas (Anchor QEA 2011b), except for an approximately 0.2-acre wetland area located along the eastern shore in CU69. Property owners have installed docks along the shoreline in the CU69 wetland area, and boats pass through the adjacent channel toward the navigational channel and/or Lock 6. As shown on Figure C-3c in Attachment C, this wetland area in CU69 has been relocated to an area in CU71 along the eastern shoreline.

The backfilling approach for wetland areas varies based on location-specific considerations as described below. The conceptual wetland seeding/planting approach is described in Section 3.7 and Attachment C.

Typical RFW Construction Areas

Except as noted below for CU60, CU68 through CU70, and CU76, the backfilling approach for RFW construction areas will be similar to the approach implemented in RFW construction areas during previous dredging seasons. Backfill will be placed in the RFW construction areas to restore pre-dredge bathymetry. The upper 1 foot of RFW construction areas will be constructed using Type 5 backfill (a mixture of Type 2 backfill and topsoil – see Section 3.6.2.1). If more than 1 foot of backfill is required to construct the RFW areas to pre-dredge bathymetry, Type 2 material will be placed below the upper 1-foot layer of Type 5 material or, at the contractor's option, Type 5 backfill material will be placed within the entire depth of the RFW construction areas. Portions of RFW construction areas extending below the elevation subject to wave action, 117.0 ft (NAVD88) in Reach 8 or 100.5 ft (NAVD88) in Reach 6, will not receive an erosion control fabric (see Detail 4 on Drawing B-2127 and Detail 4 on B-2128 – Appendix 2).

Supporting side slopes of 3:1 (horizontal:vertical) will be created extending from the edge of the RFW construction area down to the adjoining backfill or cap surface.

The backfill design for the RFW construction areas has been adjusted as follows based on discussions with EPA and experience during previous dredging seasons:

- A lighter erosion control fabric (Nedia KoirMat™ 400, as manufactured by Nedia Enterprises, Inc. or equivalent) has been specified for placement in RFW construction areas. This material is lighter and has a shorter biodegradation period than the coir fiber fabric previously specified for use in RFW construction areas. See Specification Section 13720 (Backfilling/Capping, Appendix 1).

- Erosion control fabric will not be placed above Type 5 backfill in portions of large RFW construction areas that are protected from higher river flows and vessel wave energy. These locations are shown on B-2313 through B-2328 (Appendix 2).

- The wetland boundary material will not be placed in all RFW construction areas, but will be specified for placement in areas that are most likely to be impacted by waves resulting from vessel traffic. In addition, wetland boundary materials will not be required in RFW construction areas extending below 117.0 ft (NAVD88) in Reach 8 or 100.5 ft (NAVD88) in Reach 6.

Details and example cross-sections for the typical RFW construction areas are identified on Drawings B-2127 and B-2128 (Appendix 2). The RFW construction area locations are identified on Drawings B-2313 through B-2328 (Appendix 2).

The backfill placement and tolerance requirements for RFW construction areas restored to pre-dredge bathymetry are described in Specification Section 13720 (Backfilling/Capping; Appendix 1) and have not changed for Phase 2, Year 3.

The RFW construction areas will be seeded under the dredging operations contract in accordance with existing Contract 42A Specification Section 13701 (Riverine

Fringing Wetland Seeding; Appendix 1), which has been updated to include reference to the RFW planting zones in Reach 6. Zone A and Zone B RFW areas will be seeded regardless of whether an erosion control fabric is placed.

RFW Construction Areas – CU60 and CU76

The delineated wetland area in CU60 is approximately 3.5 acres and consists of shallow water along the shoreline immediately upstream of Thompson Island Dam. This wetland includes portions of New York State Wetland F-26. The wetland plant species identified in this area include water lily (*Nymphaea odorata*), great burreed (*Sparganium eurycarpum*), reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), and buttonbush (*Cephalanthus occidentalis*). Submerged aquatic vegetation occurs along the edge of the delineated RFW in CU60 and farther out into the river.

The delineated wetland area in CU76 is approximately 2.75 acres and consists of shallow water south of the Route 4 Bridge. The wetland plant species identified in this area include water lily, great burreed, buttonbush, cattail (*Typha angustifolia*), rice cutgrass (*Leersia oryzoides*), and pickerelweed (*Pontederia cordata*).

The current backfill design for the RFW construction areas in CU60 and CU76 includes restoration to pre-dredge bathymetry using the same approach as described above for the typical RFW construction areas. However, the backfilling design for these areas may be subject to revision based on additional discussions with the Dredging Contractor related to access to the dredging/backfill areas. Potential revision to the backfilling approaches for these areas may include placement of backfill at varying elevations, similar to the approach described below for CU68 through CU70. Any proposed changes to the backfilling approach for the CU60 or CU76 wetland areas will be submitted to EPA for review and approval prior to implementation.

CU68-CU70 Wetland Construction Area

This wetland area is an approximately 6.6-acre shallow water area located in the central portion of CU68, CU69, and CU70 in Reach 6. This delineated wetland area is approximately 1,200 feet long and varies in width up to approximately 350 feet. The wetland plant species identified in this area include water lily and wild rice (*Zizania aquatica*); the latter species dominates approximately 4.1 acres. Figure 3-2 shows the extent of wild rice and water lily delineated in the CU68-CU70 Wetland Construction Area and the existing bathymetry elevations in this area.

The proposed backfilling and planting approach for this area includes the construction of a diverse wetland community with areas to support wild rice and areas to support other emergent, floating and submerged aquatic vegetation. A minimum of 4.1 acres of the CU68-CU70 wetland complex will be designated for wild rice and the remaining area designated as wetland planting areas for the planting of other emergent, floating and submerged aquatic vegetation. The final wild rice seeding areas and wetland planting areas will be determined following completion of dredging and backfilling operations and pre-planting surveys. The final habitat construction designs for the CU68-CU70 wetland complex may include wetland plantings intermixed with wild rice seeding. In 2013, under the dredging contract (Contract 42A), wild rice seeding will be conducted within the entire CU68-CU70 wetland construction area footprint following backfill placement. Wild rice seeding in following seasons as part of the habitat construction work will be performed within final designated wild rice seeding areas and wetland planting will be conducted in the final designated wetland planting areas. The list of species to be planted will be determined based on the final elevations in the wetland planting areas.

Based on discussions with EPA, the specific backfilling approach for this area is summarized below:

- Where isolation caps are placed, a minimum of 1-foot layer of backfill (Type 5 backfill or Type 2 backfill as noted below) will be placed above the isolation cap (see Drawing C-2225 in Appendix 2).

- Access dredging has been proposed by the dredging contractor in approximately 2.2 acres of the wetland area to provide access to complete dredging in the area (the actual extent of access dredging necessary will depend on conditions encountered at the time of dredging – see Section 3.2.2). The access dredging areas will be designated for backfill placement to an elevation of 99.1 ft (NAVD88) (3-foot water depth) or to existing bathymetry, whichever is lower.

- The western portion of the wetland complex will be backfilled to pre-dredging bathymetry or to an elevation of 101.1 ft (NAVD88) (1-foot water depth) or higher if placement of a minimum 1 foot of backfill results in higher elevations. The areas for backfill placement to pre-dredging bathymetry and to an elevation of 101.1 ft (NAVD88) are shown on Drawing B-2129 (Appendix 2). At EPA's request, backfill placement to an elevation of 101.1 ft (NAVD88) will include placement of backfill material above pre-dredging bathymetry in some areas.

- The eastern portion of the wetland complex (outside of the access dredging areas) will be designated for backfill placement as follows:
  - Areas where pre-dredging elevations are equal to or above 100.1 ft (NAVD88) (2-foot water depth) will be designated for backfill placement to an elevation of 100.1 ft (NAVD88) or higher if placement of a minimum 1 foot of backfill results in higher elevations.
  - Areas where pre-dredging elevations are below 100.1 ft (NAVD88) will be designated for backfill placement to pre-dredging bathymetry.
- Areas designated for backfill placement to elevations of 99.1 ft (NAVD88) or higher will receive a 1-foot layer of Type 5 backfill. If more than 1 foot of backfill is required to construct these areas to the final elevations, Type 2 material will be placed below the upper 1-foot layer of Type 5 material.
- Areas designated for backfill placement to elevations below 99.1 ft (NAVD88) will receive Type 2 material.
- Erosion control fabric will not be placed in the CU68-CU70 wetland construction area.
- Supporting side slopes will be constructed using Type 5 material to transition between areas where the post-backfill elevations vary within the wetland complex.
- Supporting 3:1 (horizontal:vertical) side slopes will be constructed using Type 2 material extending from the edge of the wetland down to the adjoining backfill surface.

Wild rice seeding will be performed over the entire CU68-CU70 wetland area following backfill placement.

Conceptual backfill plans have been developed for the CU68-CU70 Wetland Construction Area based on the backfill approach outlined above, the EoC surface (see Attachment A), and preliminary access dredging information provided by the Dredging Contractor. Figure 3-3 shows a conceptual backfill plan. Because the final post-dredging elevations are currently unknown and will depend on the extent of re-dredging necessary and the extent of access dredging (see Section 3.2.2), the final layout, details, and elevations related to the backfilling approach for this area will be determined after dredging.

The CU68-CU70 Wetland Construction Area is identified on Drawings B-2319 and B-2320 (Appendix 2). Details and an example cross-section for construction of the CU68-CU70 Wetland Construction Area are shown on Drawing B-2129 (Appendix 2).

Specification Section 13720 (Backfilling/Capping; Appendix 1) has been revised to incorporate the backfill placement and tolerance requirements for the CU68-CU70 Wetland Construction Area. Specification Section 13701 (Riverine Fringing Wetland Seeding; Appendix 1) has also been updated to incorporate wild rice seeding requirements for the CU68-CU70 Wetland Construction Area.

After dredging is completed and prior to backfill placement, the Dredging Contractor will be provided with the locations, extents, and elevations for the placement of backfill in the wetland area following the approach outlined above. The actual locations and elevations for backfill placement will be based on post-dredging elevations. The final backfill design for this wetland area will be developed after the completion of dredging and submitted to EPA for review and approval prior to implementation.

3.6.3 Isolation Caps

Engineered caps will be installed in certain dredge areas in accordance with the Residuals Standard criteria to act as a physical barrier that both isolates and stabilizes the residual sediment. Placement of the cap will sequester residual sediment from direct interaction with the overlying water column or benthos. An armor layer will provide additional protection of the isolation layer through resistance to erosion due to currents, vessel wakes and waves, propeller wash, and ice. The criteria requiring or allowing for installation of an engineered cap based on post-dredging residuals concentrations are set forth in the 2013 PSCP, subject to the capping limits discussed in the 2013 PSCP.

Between June and August 2012, GE and EPA met to discuss technical details regarding the applicability of the cap design for River Sections 2 and 3. Based on those discussions and considerations regarding conservative assumptions that were used as part of the previous modeling for the existing cap design, EPA agreed that, provided the cap design approved in the 2011 FDR and 2012 FDR is applied for the remaining Phase 2 dredge areas, additional data collection (including groundwater flux data) and modeling related to future cap design will not be required. A detailed cap design analysis was presented in the approved 2011 FDR (Attachment F of the 2011 FDR), and a summary of the cap design was presented in the 2012 FDR.

As detailed in the 2011 FDR and 2012 FDR, Table 3-5 presents the two cap prototype designs that have been developed.

Table 3-5 Summary of Design for Prototype Caps

Cap Type	Area	Cap Materials and Thickness
Medium-Velocity Isolation Cap Type C	Outside navigation channel, with average water velocities ≤ 5 ft/s based on a 100 yr event	A minimum 9-inch isolation layer of Type 2 material with 2% organic carbon content
		A 6-inch armor layer of Type N material (see Specification Section 02206 [Backfill/Cap Material]; Appendix 1)
High-Velocity Isolation Cap Type C	Within navigation channel or outside navigation channel with average water velocities >5 ft/s based on a 100 yr event	A minimum 9-inch isolation layer of Type 2 material with 2% organic carbon content
		A 6-inch armor layer of modified Type O material (see Specification Section 02206 [Backfill/Cap Material]; Appendix 1)

As noted in Table 3-5, caps located within the limits of the navigation channel are specified as the high-velocity cap design. Also, in accordance with the Phase 2 EPS and the Phase 2 CDE, the top elevation of caps after placement must provide at least 14 feet of water depth. This equates to an elevation of 103.2 ft (NAVD88) in Reach 8 based on the NYS Canal Corporation's Barge Canal Datum (BCD) low-pool elevation of 117.2 ft (NAVD88) and an elevation of 86.7 ft (NAVD88) in Reach 6 based on the NYS Canal Corporation's BCD low-pool elevation of 100.7 ft (NAVD88).

River velocities for the 100-year flow conditions were predicted using the hydrodynamic model developed for the Upper Hudson River (see Attachment D of the Phase 2 IDR) to determine areas where medium-velocity isolation caps and high-velocity isolation caps would be designated. Figures F-1 through F-10 in Attachment F show the modeled velocity distributions for CU49, CU55 to CU60, and CU67 to CU77 under 100-year flow conditions. These figures serve as a basis for determining armor types for the dredge areas outside the navigation channel if a cap is required. Although the hydrodynamic model does not provide coverage for CU78, this area is located immediately upstream of Lock 5, where surface water velocities are slower than in the main river channel. Therefore, medium-velocity isolation caps have been designated for those portions of CU78 located outside of the navigation channel.

Details and example cross-sections for these prototype isolation caps are provided on Drawing C-2121 (Appendix 2). The potential locations for placement of the medium- and high-velocity isolation caps are identified on Drawings C-3113 through C-3128 (Appendix 2).

Long-term monitoring and maintenance requirements for the isolation caps to be installed in Phase 2, Year 3 will be described in the Operation, Maintenance, and Monitoring Plan for 2013 Caps and Habitat Replacement/Reconstruction (2013 Cap/Habitat OM&M Plan; to be submitted in 2014), based on those described in the Operation, Maintenance, and Monitoring Plan for Phase 2 Year 1 Caps and Habitat Replacement/Reconstruction (Phase 2 Year 1 Cap/Habitat OM&M Plan; Parsons 2012b).

3.6.4 Backfill and Cap Material Placement Techniques

Based on experience during previous dredging seasons, it is anticipated that backfill and cap materials will be placed by taking materials from a deck barge using an excavator with a clamshell bucket. Placement using this method is achieved through surface discharge. This method has proven to meet the placement accuracy and tolerance requirements for the range of materials and in-river conditions. Final details on the methods to be used for backfill and cap placement will be determined by the Dredging Contractor and described in the 2013 RAWP.

3.6.5 Backfill and Cap Material Sources

Potential sources of backfill and cap materials, the capability of these sources to meet the required material types and quantities, and the routes of delivery are described in the 2013 RAWP.

3.6.6 Shorelines

Shoreline construction is separated into two components: shoreline stabilization in areas immediately below the designated shoreline elevation and shoreline repair in areas above the designated shoreline elevation.

3.6.6.1 Shoreline Stabilization

For the bank areas immediately below the defined shoreline elevation (i.e., 119.0 ft [NAVD88] elevation in Reach 8 and 102.1 ft [NAVD88] elevation in Reach 6), shoreline stabilization (or shoreline treatments) will be applied in areas where dredging is performed up to the designated shoreline elevation. Three shoreline treatment types have been applied in the final design for Phase 2, Year 3 (near-shore backfill, Type P armor stone, and RFW construction) with consideration to minimize hardening of the shoreline.

On October 20, 2008, GE and EPA conducted a field inspection to review the shoreline treatments proposed in the Phase 2 IDR in Reach 8 and attain concurrence on the appropriate shoreline treatment for each area. On October 17, 2012, a field inspection was conducted to identify the shoreline treatments proposed for Reach 6.

The determination of the types of shoreline stabilization to be applied was based on the following considerations:

- The presence of shoreline structures, including roads, sheet piling, retaining walls, bridge abutments, boat launches, and outfalls;
- The presence of maintained shoreline, including riprap, armor stone, and gabion baskets;
- The slope of the riverbank;
- Evidence of existing erosion;
- Property ownership along the shoreline;
- Proximity of the shoreline to the navigation channel; and
- To minimize hardening of the shoreline, to the extent practical.

Shoreline stabilization requirements are described in Specification Section 13898 (Shoreline Stabilization; Appendix 1). The types and locations of each shoreline stabilization treatment are shown on Drawings B-3113 through B-3128 (Appendix 2).

Details for the shoreline stabilization treatments are identified on Drawing B-2221 (Appendix 2). In response to a request from EPA, Drawing B-2221 has been revised to add a detail showing placement of Type 2 backfill over the Type P shoreline treatment at the direction of the Construction Manager if specific shoreline areas are identified during dredging operations where exposed Type P stone is undesirable.

Long-term monitoring and maintenance requirements for stabilized shoreline areas will be described in the 2013 Cap/Habitat OM&M Plan, based on the Phase 2 Year 1 Cap/Habitat OM&M Plan.

3.6.6.2 Shoreline Repair

The Dredging Contractor will be responsible for repairing any disturbed shoreline areas above the designated shoreline elevation.

If disturbed, areas above the designated shoreline elevation will be constructed as moderate- or low-energy shorelines based on surface water velocity profiles (above and below 1.5 ft/s, respectively). Shoreline construction will consist of seeding (low-energy) or seeding and live staking (moderate-energy).

Typical shoreline repair details are shown on Drawing B-2222 (Appendix 2). Requirements for repair of shoreline areas disturbed during the dredging operations are presented in Specification Sections 02921 (Seeding; Appendix 1) and 13705 (Shoreline Repair and Planting; ARCADIS 2012a).

3.7 Habitat Construction – Phase 2, Year 3 Dredge Areas

Habitat construction in Phase 2 areas is based on river velocity, water depth, presence of SAV vegetation and RFWs prior to dredging, and the results of an SAV model. The model evaluates whether conditions are suitable for planting and growth of SAV and is further described in Attachment H of the Phase 2 IDR. The SAV model was not updated for this Phase 2, Year 3 design. The locations and estimated volumes for placement of additional habitat layer backfill required by the Phase 2 CDE have been developed as described in Attachment C.

The conceptual design for habitat construction planting areas for CU49, CU55 through CU60, and CU67 through CU78 is presented in Attachment C. The final habitat construction design for the Phase 2, Year 3 dredge areas will depend on the dredging operations actually completed in these CUs. Drawings and specifications associated with the final habitat construction design for these CUs will be provided to EPA in a separate design submittal(s).

The habitat construction in these areas will be performed in subsequent years. Habitat construction for the WGIA is planned for 2014. Long-term monitoring and maintenance requirements for the constructed habitats will be described in the Cap/Habitat OM&M Plan for the year in which they are constructed.

3.7.1 Unconsolidated River Bottom Habitat

Unconsolidated river bottom (UCB) habitat will be reconstructed through the placement of Type 1 or Type 2 backfill. The locations where Types 1 and 2 backfill would be applied are shown on Drawings B-2313 through B-2328 (Appendix 2).

3.7.2 Submerged Aquatic Vegetation Beds

SAV beds will be constructed through both planting and natural recolonization. Planting areas were selected based on the presence of vegetation prior to dredging, the SAV model scores, estimated locations for placement of additional habitat layer backfill material, and water depth, as described in Attachment C. The SAV planting and natural recolonization areas for CU49, CU55 through CU60, and CU67 through CU78 are shown on figures in Attachment C. Those figures also show SAV contingency areas, some of which may be planted if any of the designated SAV planting areas do not meet pre-planting bathymetry requirements. All SAV contingency areas that are not planted will be designated as natural recolonization areas.

The conceptual SAV primary and contingency planting areas and natural recolonization areas associated with CU49, CU55 through CU60, and CU67 through CU78 are shown on Drawings B-2313 through B-2328 (Appendix 2). An electronic data file of the conceptual SAV primary and contingency planting areas and natural recolonization areas is provided on the CD-ROM included with this report.

3.7.3 Riverine Fringing Wetlands

RFWs affected by the remediation will be replaced at their current locations, to the extent practicable. As described in Attachment C, an approximately 0.2-acre wetland area located along the eastern shore in CU69 has been relocated to the eastern shoreline in CU71. As also described in Attachment C, portions of New York State Wetland F-26 affected by remediation will be replanted as RFW or SAV to meet the substantive requirements of Environmental Conservation Law (ECL) Article 24.

Construction of replacement RFWs will involve backfilling of the RFW areas as described in Section 3.6.2.5. RFW areas will then be planted and seeded with species native to the Upper Hudson River. Wetland construction areas are further discussed in

Attachment C and shown on figures in Attachment C. Attachment C also provides a description of the conceptual habitat construction planting approach for the large wetland area in CU68 through CU70.

3.8 Threatened and Endangered Species Considerations

As discussed in Section 2.2.4, the conservation measures listed for bald eagles in the Final BA will be followed to minimize disturbances to eagles. These were previously incorporated into Specification Section 01140 (Work Restrictions; ARCADIS 2012a) and have not changed for Phase 2, Year 3.

3.9 Quality of Life Standards

The design has been developed with the objective of achieving the criteria set forth in the Phase 2 QoLPS for air quality, odor, noise, lighting, and navigation, which are summarized in Section 2.1.3. A summary of how the QoLPS parameters have been considered in the design for Phase 2, Year 3 is provided below.

3.9.1 Air Quality – PCBs

In accordance with the Phase 2 CDE, air mitigation BMPs will be implemented in dredging areas with a potential to emit PCBs to the air at levels close to or exceeding the applicable PCB air quality standard, based on criteria defined in the Phase 2 CDE. Such areas are shown on Drawings D-3113 through D-3128 (Appendix 2). The air mitigation BMPs to be implemented in those areas are included in Specification Section 13803 (Dredging; Appendix 1) and have not changed for Phase 2, Year 3.

The air mitigation BMPs to be implemented during processing facility operations (as summarized in Section 2.3.2 of the 2012 FDR) have not changed for Phase 2, Year 3. Other measures to reduce PCB emissions will include wetting down haul roads to reduce dust.

In addition to the routine BMPs to be implemented for air mitigation BMP areas, contingent BMPs will be implemented in dredge areas or areas around the processing facility where measured PCB concentrations at a nearby receptor show an exceedance of the applicable PCB air quality standard on 3 consecutive days. The contingent air mitigation BMPs to be considered in these circumstances (as described in Section 2.3.2 of the 2012 FDR) include those listed in the 2013 PSCP.

3.9.2 Air Quality - NAAQS

An air quality modeling analysis conducted during the Phase 1 design demonstrated that the emissions of criteria pollutants from in-river activities and processing facility operations during Phase 1 were not predicted to cause exceedances of the National Ambient Air Quality Standards (NAAQS). The Phase 2 PSCP Scope and Phase 2 CHASP Scope require GE to evaluate the need to revise the prior analysis to reflect any anticipated operational or equipment changes in Phase 2 that could affect these pollutants. If no such change is anticipated, no additional modeling or further evaluation of criteria pollutants is needed, and no provisions for monitoring or control of those pollutants will be necessary during Phase 2.

NAAQS analyses were previously conducted and presented as attachments to the 2011 FDR and 2012 FDR considering anticipated operational or equipment changes that could affect these criteria pollutants. These previous analyses confirmed that the Phase 1 analysis demonstrating compliance with the NAAQS should likewise apply to the 2011 and 2012 dredging seasons, and that there was no need for a more detailed revised NAAQS analysis. Phase 2, Year 3 dredging and processing facility operations are expected to be similar to those in Phase 2, Year 2, with no design changes that could significantly affect emissions of criteria pollutants. Thus, a revised NAAQS evaluation has not been completed for Phase 2, Year 3. Similarly, no provisions for monitoring, control, or contingency measures for criteria pollutants will be necessary for Phase 2, Year 3.

GE is currently evaluating the addition of push tugs to the project for the transport of barges over longer distances. Because the Phase 2, Year 2 estimate of criteria pollutant emissions presented in the 2012 FDR was significantly lower than the Phase 1 design estimate, it is unlikely that this change will impact compliance with the NAAQS. GE will verify this assumption following procurement of the additional push tugs.

Nevertheless, consistent with the 2011 FDR and the 2012 FDR, preventative or contingency measures are included in the specifications to prevent the generation of particulates in the form of dust during Phase 2, Year 3 operations. These measures include the following:

- Site-specific Dust Prevention and Control Plans will be prepared by the contractors that detail the methods to be used to prevent and control onsite dust generation and migration from the site during operations.

- Haul roads will be wetted down, as needed, to minimize dust generation.

- The Processing Facility Operations Contractor will be required to prevent and mitigate spills of sediment on haul roads.

3.9.3 Odor

It is not anticipated that sediments dredged in Phase 2, Year 3 will generate odors that will reach the concern or exceedance levels in the QoLPS. Routine monitoring, reporting requirements, and action levels for additional monitoring under the Phase 2 QoLPS for odor are described in the Phase 2 RAM QAPP. Specific actions that will be taken to address exceedance of the criteria in the Phase 2 QoLPS and associated reporting requirements are discussed in the 2013 PSCP.

3.9.4 Noise

The Phase 2 CHASP Scope and Phase 2 RAM Scope require that the Phase 2 design include an updated evaluation of noise intensity generated by equipment, processes, and traffic associated with site operations based on Phase 1 noise measurements. They provide that if Phase 2 will include equipment changes or changes to the processing facility that could result in increased noise levels over those experienced in Phase 1, this evaluation would include noise attenuation modeling, and GE would conduct a study at the beginning of dredging or processing facility operations (as applicable) to validate the modeling analysis. Given certain additional equipment installed at the processing facility in early 2012, GE conducted a noise monitoring survey in June 2012 at locations around the processing facility. That survey showed that the installation of the new equipment at the processing facility did not result in a significant increase in noise levels compared to those in 2011, and that there was only one exceedance of the applicable noise criteria (in this case, the 24-hour residential standard) during the survey. The noise levels from both processing facility operations and dredging operations during Phase 2, Year 3 are not expected to be significantly different from those in prior dredging seasons. As a result, there is no need for an additional noise monitoring survey in 2013.

However, during Phase 2, Year 3 (as in the prior Phase 2 seasons), noise monitoring will be conducted by the Dredging Contractor and Processing Facility Operations Contractor at the initial startup of any operation or equipment different from that previously used in this project and that could result in increased noise levels. This monitoring will not be considered monitoring for compliance with the Noise Standard.

However, if a sound level based on the contractor monitoring is above the numerical criteria established in the Noise Standard, additional monitoring will be conducted at a location closer to the nearest receptor(s) to assess attainment of those criteria; a noise level above those criteria will be considered an exceedance only if confirmed by that follow-up monitoring. Noise monitoring will also be conducted in response to noise complaints. Routine monitoring, reporting requirements, and action levels for additional monitoring under the Phase 2 QoLPS for noise are described in the Phase 2 RAM QAPP.

Specification Section 02931 (Noise Restrictions and Controls; Appendix 1) outlines the noise standards, requirements, restrictions, and controls during the project operations. This specification identifies the routine noise monitoring to be conducted by the contractors at the initial startup of any operation or equipment and for any changes in equipment, procedures, or conditions. If compliance noise monitoring (whether conducted as a follow-up to the contractor monitoring or in response to a complaint) shows an exceedance of an applicable noise standard, the contractor will be responsible for implementing engineering controls or other mitigation measures, as appropriate, to address such exceedance.

3.9.5 Lighting

The Phase 2 CHASP Scope requires that the Phase 2 design include an updated evaluation, based on Phase 1 light measurements, of light intensity generated by illumination of active dredge areas, processing areas, loading and staging areas, administration areas, and other work areas on and near the river, considering any equipment changes anticipated for Phase 2 that could affect lighting levels. For Phase 2, Year 3, operations are not expected to cause an increase in lighting impacts over those experienced during previous dredging seasons.

During Phase 2, Year 3, light monitoring will be conducted by the Dredging Contractor and Processing Facility Operations Contractor at the initial startup of any operation or equipment different from that used previously in this project and that could result in increased light levels. This monitoring will not be considered monitoring for compliance with the Lighting Standard. However, if a light level based on contractor monitoring is determined to be above a lighting standard, additional monitoring will be conducted at a location closer to the nearest receptor(s) to assess attainment of the standard. A light level above the level of a standard will be considered an exceedance only if confirmed by follow-up monitoring. Light monitoring will also be conducted in response to lighting complaints. Routine monitoring, reporting requirements, and action levels for additional monitoring under the Phase 2 QoLPS for lighting are described in the Phase 2 RAM QAPP.

Specification Section 02936 (Lighting Restrictions and Controls; Appendix 1) outlines the lighting standards, requirements, restrictions, and controls during the project operations. This specification identifies routine light monitoring to be conducted by the contractors at the initial startup of any operation or equipment and for any changes in equipment, procedures, or conditions. If compliance light monitoring (whether conducted as a follow-up to the contractor monitoring or in response to a complaint) shows an exceedance of an applicable lighting standard, the contractor will be responsible for implementing engineering controls or other mitigation measures, as appropriate, to address such exceedances.

3.9.6 Navigation

The dredging and dredged material transport operations in Phase 2, Year 3 will be implemented in a manner similar to that of previous dredging seasons. As noted in Section 3.2, there are a few notable differences related to navigation for the Phase 2, Year 3 dredging season compared to previous dredging seasons. These include the following: there will be a smaller percentage of dredging in the navigation channel than in previous dredging seasons; sediments dredged in Reach 6 will be transported through Lock 6 and the associated land-cut area north of this lock; and the dredged material transport routes are longer.

To meet the Phase 2 QoLPS for navigation, this project will be implemented to maintain safety and productivity while avoiding unnecessary disruption of non-project-related navigation, allowing efficient performance of the project. The final design incorporates certain accommodations, preventative control systems, notification protocols, contingencies, and mitigation measures to maximize safety and productivity and to avoid unnecessary disruption of non-project-related navigation, while allowing efficient performance of the project. General requirements relating to navigation are described in Section 3.9.6 of the 2012 FDR and are not repeated in this report.

Specification Sections 02936 (Lighting Restrictions and Controls; Appendix 1), 13810 (In-Water Material Transport; Appendix 1), 13820 (Anchoring During Dredging Operations; Appendix 1), 13840 (Transport Procedures Through Canal Locks; Appendix 1), 13845 (Aids to Navigation During Dredging Operations; ARCADIS 2012a), 13860 (Marine Traffic Control; Appendix 1), 13897 (Marine Equipment; Appendix 1), and 01140 (Work Restrictions; ARCADIS 2012a) include the requirements, restrictions, and controls to be followed during the project operations to meet the Navigation Performance Standard.

Additional information regarding the scope of navigation monitoring, notification, contingencies, mitigation, and complaint management is provided in the 2013 PSCP and the 2013 CHASP.

4. 2013 Habitat Construction Planting

Several SAV construction areas that were dredged and backfilled in Phase 2, Year 1 and Phase 2, Year 2 will be planted in 2013. The 2013 habitat planting and plant supply operations will be conducted under Contract 42A and Contract 53A. Contract 42A will install the SAV planting units requiring divers, while Contract 53A will supply the SAV planting units to the divers. The technical specifications associated with the 2013 planting operations are provided in Appendix 3, and the drawings are provided in Appendix 4. An electronic data file of the 2013 planting areas is provided on the CD-ROM included with this report.

The planting areas shown on the drawings are considered preliminary. The suitability of each planting area will be determined by a pre-planting survey conducted in the spring of the planting year by the Construction Manager. The planting areas may be adjusted based on the results of the pre-planting survey. The results of the pre-planting survey and any adjustments to the planting areas based on the survey will be reviewed with EPA prior to planting. If necessary, revised drawings depicting the final planting areas will be issued to the contractors prior to planting.

Planting is expected to begin in CU10 and continue downstream into planting areas located in CU20 through CU29. SAV planting areas are shown on Drawings H-2102 and H-2104 through H-2107 (Appendix 4). The planting details are shown on Drawing H-2501 (Appendix 4). The plant installation requirements are described in Specification Section 13704 (Planting Aquatic Vegetation Beds; Appendix 3), and the plant supply requirements are described in Specification Section 13705 (Aquatic Vegetation Planting Unit Supply; Appendix 3).

Due to the size of the areas to be planted, and depending on the actual seasonal river conditions, it may not be possible to plant all of the SAV areas shown on these drawings in 2013.

No RFW areas are shown on these drawings, and no RFW planting is planned for 2013.

Optional supplemental planting areas are also shown on the drawings (Appendix 4). Those areas were not previously designated as SAV or RFW habitat construction areas, but are shallow enough based on post-construction bathymetry to support some RFW and SAV species. These areas may be planted at GE’s discretion. If planting in optional supplemental areas occurs, Contract 53A will supply and install the aquatic vegetation planting units. The plant supply and installation requirements for these areas are described in Specification Section 13707 (Planting Supplemental Aquatic Vegetation Beds; Appendix 3). These areas are not subject to other design requirements such as initial and final approval. Any SAV or RFW plantings in these areas will be discussed with EPA and documented on CU Certificate of Completion Form 3 record drawings.

5. Remedial Action Implementation – Phase 2, Year 3

This section summarizes the contracts under which Phase 2, Year 3 dredging and facility operations will be conducted, and provides a general description of the remedial action activities to be performed under each contract. Also included in this section is a description of the remedial action submittals for Phase 2, Year 3 and a reference to the schedule for implementation of the remedial action activities.

5.1 Remedial Action Contracts – Phase 2, Year 3

The remedial action for Phase 2, Year 3 has been organized into the following contracts based on the nature of work to be accomplished under each:

- *Contract 30 – Processing Facility Operations:* As in previous dredging seasons, the processing facility operations will be conducted under Contract 30, which covers seasonal startup, commissioning, and sediment processing operations at the processing facility. Because the processing facility will be operated under this same contract issued for the work implemented during 2011 and 2012, the specifications for Contract 30 (issued with the approved 2011 FDR and as revised in 2012) are not presented with this design report. Any changes to the technical specifications for Contract 30 will be provided to EPA for review under separate cover.

- *Contract 42A – Dredging Operations:* During 2013, dredging operations and SAV planting will be conducted under Contract 42A, which also governed the 2012 dredging operations. Revised specifications and new or revised drawings for Contract 42A are provided with this 2013 FDR (see Appendix 1 and Appendix 2). Other Contract 42A specifications and drawings issued with the approved 2012 FDR or 2012 FDR Addendum 1 that have not changed will also apply to the Phase 2, Year 3 dredging operations (but are not provided with this report). Specifications and drawings for 2013 planting operations to be conducted under Contract 42A are also provided with this 2013 FDR (see Appendix 3 and Appendix 4).

- *Contract 53A – Habitat Planting and Plant Supply:* The 2013 SAV plant supply operations will be conducted under Contract 53A. The technical specifications and drawings for 2013 plant supply operations under Contract 53A are provided in Appendix 3 and Appendix 4.

- *Contract 60 – Rail Yard Operations:* The rail yard operations will be conducted under Contract 60, which is the same contract issued for the work implemented during 2011 and 2012. Consequently, specifications for Contract 60, which were issued with the approved 2011 FDR and revised in 2012, are not presented with this design report. Any changes to the technical specifications for Contract 60 will be provided to EPA for review under separate cover.

A contract for on-river water treatment operations may also be awarded if the Construction Manager determines that such a system is necessary in 2013. Performance specifications for that potential work were appended to the approved 2012 FDR (ARCADIS 2012a). If implemented, any changes to the technical specifications for the on-river water treatment operations contract will be provided to EPA for review under separate cover.

5.2 Remedial Action Work Plan and Other Remedial Action Submittals – Phase 2, Year 3

Section 3.1 of the revised SOW (EPA 2010c) requires GE to submit a RAWP for Phase 2 dredging and facility operations to be performed in each construction year of Phase 2. GE is submitting the 2013 RAWP separately from this 2013 FDR. The 2013 RAWP describes the dredging and facility operations to be performed as part of Phase 2, Year 3, the equipment staging for dredging operations, and a dredge production schedule. As indicated in Section 1.4 above, the 2013 RAWP includes the following plans as appendices: 2013 DQAP, 2013 Facility O&M Plan, 2013 TDP, 2013 PSCP, 2013 PAP, and 2013 CHASP.

GE is also submitting a Phase 2 Remedial Action Health and Safety Plan for 2013 (2013 RA HASP; Parsons 2013g). The 2013 RA HASP addresses potential worker health and safety issues for GE and its contractors' workers, describes potential hazards and impacts to project workers, and identifies the steps that GE and its contractors will take to prevent and respond to them.

In 2012, GE submitted and EPA approved a Phase 2 RAM QAPP (Anchor QEA 2012), which describes in detail the monitoring and sampling activities, including sample collection, analysis, and data handling activities, to be conducted by GE during the remainder of Phase 2, including Phase 2, Year 3. Any additions or revisions to the Phase 2 RAM QAPP for Phase 2, Year 3 will be submitted to EPA for review under separate cover as Corrective Action Memoranda.

In accordance with the revised SOW, the above-listed documents will be further revised and/or updated for each subsequent year of Phase 2, and will be submitted to EPA for review and approval.

5.3 Remedial Action Implementation Schedule – Phase 2, Year 3

The schedule for implementation of Phase 2, Year 3 dredging and facility operations is provided in the 2013 RAWP.

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7. Acronyms and Abbreviations

ARA	Archaeological Resources Assessment
ARCADIS	ARCADIS of New York, Inc.
AOC	Administrative Order on Consent
BA	Biological Assessment
BBL	Blasland, Bouck & Lee, Inc.
BCD	Barge Canal Datum
BERS	Barge Electronic Reporting System
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
CD	Consent Decree
CDE	Critical Design Elements
cfs	cubic feet per second
CHASP	Community Health and Safety Plan or Community Health and Safety Program
CU	Certification Unit
cy	cubic yards
DAD	Dredge Area Delineation
DoC	Depth of Contamination
DOT	U.S. Department of Transportation

DQAP	Dredging Construction Quality Control/Quality Assurance Plan
DRO	diesel range organic
E&E	Ecology & Environment
EoC	Elevation of Contamination
EPA	U.S. Environmental Protection Agency
EPS	Engineering Performance Standards
FDR	Final Design Report
ft/s	feet per second
g/m^2	grams per square meter
GE	General Electric Company
GLAC	Glacial Lake Albany Clay
GRO	gasoline range organic
HA	Habitat Assessment
HASP	Health and Safety Plan
HD	Habitat Delineation
HDA	Habitat Delineation and Assessment
IDR	Intermediate Design Report
m	meters
MBTA	Migratory Bird Treaty Act
mg/kg	milligrams per kilogram

MPA	mass per unit area
NAAQS	National Ambient Air Quality Standards
NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum of 1988
ng/L	nanograms per liter
NOAA	National Oceanic and Atmospheric Administration
NYS Canal Corporation	New York State Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and Maintenance
OMM	Operations, Maintenance, and Monitoring
OSI	Ocean Surveys, Inc.
PAP	Property Access Plan
PCB	polychlorinated biphenyl
PDR	Preliminary Design Report
PSCP	Performance Standards Compliance Plan
QAPP	Quality Assurance Project Plan
QoLPS	Quality of Life Performance Standards
RA CD	Remedial Action Consent Decree
RAM	Remedial Action Monitoring
RAWP	Remedial Action Work Plan

RD AOC	Administrative Order on Consent for Hudson River Remedial Design and Cost Recovery
RFW	riverine fringing wetland
RM	River Mile
ROD	Record of Decision
SAV	submerged aquatic vegetation
SEDC	Supplemental Engineering Data Collection
SOW	Statement of Work
SSAP	Sediment Sampling and Analysis Program
TDP	Transportation and Disposal Plan
TIP	Thompson Island Pool
TOC	total organic carbon
Tri+ PCBs	PCBs with three or more chlorine atoms
TSCA	Toxic Substances Control Act
UCB	unconsolidated river bottom
USGS	United States Geological Survey
VTS	vessel traffic service
WGIA	West Griffin Island Area
WQ	Water Quality

Tables

Table 3-1
Basis of Design for Dredging and Dredged Material Transport – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
PCB MPA threshold for sediment removal in River Section 1	3 g/m^2 Tri+ PCBs	· Record of Decision (EPA 2002) · Phase 2 DAD Report (QEA 2007)
PCB MPA threshold for sediment removal in River Section 2	10 g/m^2 Tri+ PCBs	· Record of Decision (EPA 2002) · Phase 2 DAD Report (QEA 2007) · RD Work Plan (BBL 2003a)
Surface sediment threshold for sediment removal in River Section 1	10 mg/kg Tri+ PCBs	· Specified in Phase 2 DAD Report (QEA 2007) · EPA's Final Decision Regarding GE's Disputes on Draft Phase 1 DAD Report and Draft Target Area Identification Report (EPA 2004c)
Surface sediment threshold for sediment removal in River Section 2	30 mg/kg Tri+ PCBs	· Specified in Phase 2 DAD Report (QEA 2007) · EPA's Final Decision Regarding GE's Disputes on Draft Phase 1 DAD Report and Draft Target Area Identification Report (EPA 2004c)
Location and depth of dredging	Design inventory dredge depths are based on removal to 1 mg/kg Total PCBs	· EoC surface was developed by Anchor QEA based on the Dredge Prism Development Steps included in the Phase 2 CDE and sediment PCB data (see Attachment A) · Dredge prisms provided with this 2013 FDR were developed by Parsons based on the Dredge Prism Development Steps included in the Phase 2 CDE and the EoC surface developed by Anchor QEA (see Attachment B) · Location and depth of 2013 dredging based on the planned removal of a minimum 350,000 cy of sediment (Phase 2 EPS)
Post-dredge sediment PCB concentration target	1 mg/kg Tri+ PCBs	· From Phase 2 EPS, additional criteria of 6 and 27 mg/kg Tri+ PCBs and 500 mg/kg total PCBs require various response actions
Target sediment removal volume	350,000 cy	· Phase 2 EPS
CUs designed for Phase 2, Year 3	CU49, CU55 through CU60, and CU67 through CU78 Dredging commenced in the WGIA (CU50 through CU54) in Phase 2, Year 2 (2012) and will be completed in Phase 2, Year 3 (2013) in accordance with 2012 FDR Addendum 1	· The design cut volume for CU49, CU55 through CU60, and CU67 through CU78 is approximately 366,900 cy based on the design dredge prism (see Table 3-4 and Attachments A and B) · The actual CUs completed and volume of sediment dredged during Phase 2, Year 3 will be dependent on the extent of re-dredging required, among other factors (see Section 3.1.1)
Re-dredge volume	To be determined	· The extent of re-dredging required may reduce the number of CUs completed and the volume of sediment removed during Phase 2, Year 3
Dredge elevation tolerance requirement	Achievement of required dredge elevation in at least 95% of the dredge area	· Phase 2 EPS and Phase 2 CDE · Required elevations in field-identified bucket refusal or clay areas, as accepted by the Construction Manager, will be considered to have been achieved (EPA 2012)

Table 3-1
Basis of Design for Dredging and Dredged Material Transport – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Canal season	Approximately 28 weeks	· Assumed length of the navigational season (i.e., early May to mid-November) based on NYS Canal Corporation operational data · Actual length of navigational season is controlled by the NYS Canal Corporation, and the actual opening and closing dates may differ from the assumed early May to mid-November season · Assumes that sufficient water flows will be available for uninterrupted lock operations · Assumes that the locks will be operational during the canal season
Dredge season (both the design cut and re-dredge passes)	Approximately 22 to 28 weeks (120 to 150 dredging days)	· Design assumption based on dredging from mid-May through mid-October or mid-November including dredging 6 days per week, observation of 3 non-working holidays (Memorial Day, Independence Day, and Labor Day), and up to 9 days of downtime assumed for conditions such as inclement weather (fog, lightning, heavy rain); or high river flows, slowdown, or shutdown per the Performance Standards; and unexpected conditions · Actual number of days available for dredging will depend on field conditions and other factors, and could be fewer than 120 or more than 150 · Design assumption of 120 dredge days provides approximately 1 month for completion of backfilling/capping operations, equipment decontamination, and demobilization prior to the NYS Canal Corporation closing the lock system (assumed to be mid-November)
Dredging hours of operation	24 hours/day; 6 days/week (with contingent seventh day)	· Design assumption – based on Phase 1 and Phase 2 experience
Dredge type	Mechanical dredge with clamshell bucket	· Phase 2 CDE · Based on Phase 1 and Phase 2 experience
Dredge bucket size	5 cy clamshell 2 cy clamshell	· Design assumption for dredge buckets expected to be used during Phase 2, Year 3 · The actual number and size of dredges necessary to meet the project requirements will be identified in the RAWP based on Dredging Contractor input
Design Cut Volume for each CU	See Table 3-4	· Volumes based on the design dredge prism developed in accordance with the Phase 2 CDE · Volumes do not account for overdredging to achieve the required elevation tolerances or the application of shoreline or structural offsets to be incorporated into the final construction dredge prism based on field survey and contractor input prior to dredging

Table 3-1
Basis of Design for Dredging and Dredged Material Transport – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Minimum average dredge rate	2,900 cy/day (average over 120 dredge days) 2,300 cy/day (average over 150 dredge days)	· Average daily removal rate needed to remove 350,000 cy of sediment over an assumed period of 120 dredge days and 150 dredge days · Peak daily dredge rates will exceed average rate · The actual number and size of dredges necessary to meet the project requirements will be identified in the RAWP based on Dredging Contractor input · Dredge rates will vary based on several factors, including, but not limited to: o Startup coordination with the Processing Facility Operations Contractor o Operational adjustments (slowdowns, shutdowns, adjustments to dredging sequencing) necessary based on compliance with the Performance Standards o High river flows or other conditions (e.g., fog) that limit safe and productive dredging o Processing facility unloading/processing rates
Shoreline definition	Reach 8: 119.0 ft elevation NAVD88 Reach 6: 102.1 ft elevation NAVD88	· See Section 3.1.2
Near-shore area	Reach 8: Area between the 119 ft shoreline and the 117.5 ft in-river pre-dredge elevation Reach 6: Area between the 102.1 ft shoreline and the 100.7 ft in-river pre-dredge elevation	· See Section 3.6.2.3
Existing conditions – river bottom contours	Multi-beam bathymetry surveys (by OSI, Thew, and CLE) and single-beam bathymetric surveys where multi-beam data have not been collected	· Bathymetric surveys conducted by OSI in 2001, 2003, 2005, and 2006 for Reach 8 and Reach 6 · Bathymetric surveys conducted by Thew Associates in 2011 for Reach 6 · Bathymetric surveys conducted by CLE Engineering, Inc. in 2012 for Reach 6
Geotechnical properties of subsurface materials	Key parameters identified in the Phase 2 SEDC Work Plan (BBL 2006b) - Data summarized in SEDC summary reports (see Section 2.2.2 of the 2012 FDR)	· Data collected during the SEDC Program
Water depths	Depth varies	· Varies based on river flow · Pre-dredging water depths based on bathymetric surveys conducted in 2001, 2003, 2005, 2006, 2011, and 2012 · Post-dredge water depths (before backfill/cap material placement) based on the Dredge Prism XYZ File
Navigation channel	As shown on the Drawings	· Location provided by Anchor QEA based on information from NYS Canal Corporation, USACE, and field measurements by Anchor QEA
Sediment chemistry	Key Parameter: · PCBs	· SSAP and SEDC database (see Section 2.2.1)

Table 3-1
Basis of Design for Dredging and Dredged Material Transport – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Geotechnical properties of shoreline	Key parameters identified in the Phase 2 SEDC Work Plan (BBL 2006b). Data summarized in SEDC summary reports (see Section 2.2.2 of the 2012 FDR).	· Data collected during the SEDC Program
In-river debris	As shown on figures in the appendices of the Phase 2 Supplemental SEDC Summary Report Addendum (Attachment B to the Phase 2 IDR; ARCADIS 2008)	· Data collected during SEDC Program. OSI surveys conducted in 2002 and 2005. Nature and location could change prior to implementation
Presence of shoreline structures and in-water structures	As shown on the G-Series Existing Condition Reference Drawings	· Data collected during SEDC Program – Nature and location could change prior to dredging · Updated to incorporate findings from field reconnaissance conducted by Parsons during 2010 and 2012 · To be verified by contractor prior to dredging
Sediment type	Varies	· Based on side-scan sonar and probing data collected during the SEDC Program
Presence of clay	Location and elevation varies (See Attachment A)	· Approximate locations and elevation of clay delineated by Anchor QEA based on data collected during the SSAP and SEDC Program · The approximate limits of where clay controls the EoC elevations are shown on figures in Attachment A - These limits represent areas where sufficient core data were available to map the elevation of the top of GLAC and GLAC is shallower than or within 2 inches deeper than the chemistry-based EoC
Presence and type of vegetation	Data summarized in habitat delineation and assessment reports	· See Section 2.2.3
Presence of archaeological resources	Data summarized in archaeological assessment reports	· See Section 2.2.5
Dredged material transport hours of operation (including lock operations)	24 hours/day, 7 days/week	· Design assumption based on Phase 1 and Phase 2 experience
Lock dimensions	Length – 328 feet Width – 45 feet <u>Area Available for Vessels:</u> Length – 300 feet Width – 43.5 feet	· NYS Canal Corporation design records
One-way lockage time	30 minutes	· Design assumption to stage and position vessel in the lock, drain or fill the lock, and exit the lock based on operational data collected during Phase 1 - Actual duration will vary and depends on the stage of lock upon vessel arrival and vessel traffic
Distance between Lock 7 and Processing Facility	1.8 miles	· Aerial mapping by Chas H. Sells 2002
Tugboat sizes	25-foot length 14-foot beam 400 hp and 600 hp	· Size of tugs procured for use on the project · The actual number and size of tugs necessary to meet the project requirements will be specified in the 2013 RAWP based on Dredging Contractor input

Table 3-1
Basis of Design for Dredging and Dredged Material Transport – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Dredged material transport barge dimensions and capacity	195-foot by 35-foot barges 1,650 tons (includes dredged material and water)	· Size of barges procured for use on the project · Barge capacity based on an assumed average barge draft of 7.75 ft and ullage tables for barges used during Phase 2, Year 1 and Phase 2, Year 2 · The actual number and size of barges necessary to meet the project requirements will be specified in the 2013 RAWP based on Dredging Contractor input
Small barge capacity (for shallow water, restricted draft areas)	100 cy	· Design assumption for the capacity of shallow draft barges for use in shallow water areas with limited access · The actual number and size of barges necessary to meet the project requirements will be specified in the 2013 RAWP based on Dredging Contractor input
Barge staging areas	Sta. 61+00 to 65+00	· Barges can be staged at staging dolphins south of Lock 7 or outside the navigation channel where there is sufficient water depth and where there are no restrictions on anchoring · Additional barge staging areas will be subject to approval by the Construction Manager
Anchoring restrictions	See D-series Drawings	· Anchoring will be restricted within areas where wetlands and SAV have been delineated outside of dredge areas, where backfill has been placed and accepted by the Construction Manager in delineated SAV and wetland areas, where SAV and RFW have been planted, where natural colonization areas have been designated, where caps have been placed, and in sensitive archaeological areas - No anchoring of work-related vessels will be permitted in the navigation channel without approval from EPA in consultation with NYS Canal Corporation
Air quality, odor, noise, lighting, and navigation performance standards	See Section 2.1.3	· Hudson QoLPS (EPA 2004b) · Memorandum titled “Quality of Life Performance Standards – Phase 2 Changes” (E&E 2010) · Requirements specified in the Phase 2 PSCP Scope (Attachment C to the Revised SOW for the Hudson River RA CD; EPA 2010c) · 2013 PSCP (GE 2013)
Air emission BMPs	See Section 3.3	· Phase 2 CDE · Required Adaptive Responses and Design Improvements for Phase 2, Year 2 (EPA 2012) · 2013 PSCP (GE 2013)

Notes:
1. References are defined in Section 6 of the 2013 FDR.
2. Acronyms and abbreviations are defined in Section 7 of the 2013 FDR.

Table 3-2
Basis of Design for Backfilling/Capping – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Backfill/cap footprint	Approximately 97.4 acres would be considered for backfill and/or cap placement within CU49, CU55 through CU60, and CU67 through CU78	· See Section 3.6.1 · The Phase 2 EPS limits the amount of capping that will be allowed in Phase 2 (see the 2013 PSCP [GE 2013])
Top elevations of caps within the navigation channel	Reach 8: 103.2 ft (NAVD88) Reach 6: 86.7 ft (NAVD88)	· 14 feet of water depth above the cap based on the NYS Canal Corporation's Barge Canal Datum low-pool elevation (BCD low-pool elevation) of 117.2 ft NAVD88 for Reach 8 and 100.7 for Reach 6 · Phase 2 EPS (EPA 2010b), Phase 2 CDE (EPA 2010c)
The top elevation of backfill within the navigation channel	Reach 8: 103.2 ft (NAVD88) * Reach 6: 86.7 ft (NAVD88) * *unless compliant residual sampling node locations exceed 1 mg/kg Tri+ PCBs (after rounding) within the first core segment after the first dredging pass	· 14 feet of water depth above the backfill material based on the NYS Canal Corporation's BCD low-pool elevation of 117.2 ft NAVD88 for Reach 8 and 100.7 for Reach 6 (Phase 2 EPS, Phase 2 CDE) · Backfill will not be placed in the navigation channel unless the post-dredging elevation is below 101.7 ft (NAVD88) in reach 8 or 85.2 ft (NAVD88) in Reach 6 - These elevations correspond to a 15.5-foot water depth (the 14-foot post-backfill placement water depth required by the Phase 2 EPS plus the 12-inch thick backfill layer and the allowable backfill placement tolerance) · In accordance with EPA's adaptive responses for 2012 (EPA 2012), at sampling nodes in the navigation channel where the residual Tri+ PCB concentration in the surface sediment after the first dredging pass exceeds 1 mg/kg (after rounding) but does not cause the average Tri+ PCB concentration in the CU to exceed 1 mg/kg or meet the other mandatory conditions for re-dredging as specified in the 2012 PSCP, backfill will be placed so long as there is approximately 12 feet of draft above the post-placement backfill surface at low-pool conditions (105.2 ft NAVD88 for Reach 8 and 88.7 ft NAVD88 for Reach 6)
Backfill thickness	Varies	· The backfill layer will be 12 inches (1 foot; ROD; EPA 2002) · Near-shore backfill will be restored to original bathymetry between the 119.0 and 117.5 ft elevation (NAVD88) in Reach 8 and 102.1 and 100.7 ft elevation (NAVD88) in Reach 6 locations where dredging extends to the defined shoreline (Phase 2 CDE) · Where placed, habitat layer backfill will be placed to either return the area to pre-dredging bathymetry or to an elevation of 114 ft (NAVD88) in Reach 8 or to an elevation of 97.1 ft (NAVD88) in Reach 6 (equivalent to a water depth of 5 feet below the shoreline elevations; Phase 2 CDE) - Habitat layer backfill may also be required above isolation caps where determined appropriate by EPA (Phase 2 CDE). · RFW areas will be restored to original bathymetry, with the exception of the CU68-CU70 Wetland Construction Area shown on the drawings

Table 3-2
Basis of Design for Backfilling/Capping – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Near-shore area	Reach 8: Area between the 119 ft shoreline and the 117.5 ft in-river pre-dredge elevation Reach 6: Area between the 102.1 ft shoreline and the 100.7 ft in-river pre-dredge elevation	· Near-shore backfill will be restored to original bathymetry in the near-shore area (Phase 2 CDE) · In Reach 8, pre-dredging bed elevation equals 117.5 ft (NAVD88) at near-shore setpoints, which are located along the pre-dredging bathymetric 117.5 ft elevation contour line based on OSI bathymetric surveys conducted in 2005 and 2006 · In Reach 6, pre-dredging bed elevation equals 100.7 ft (NAVD88) at near-shore setpoints, which are located along the pre-dredge bathymetric 100.7 ft elevation contour line based on bathymetric surveys conducted in 2011 and 2012 by Thew Associates and CLE Engineering, Inc.
Flow velocities and flow return frequency – backfill design	≤ 1.5 ft/s – Type 1 backfill > 1.5 ft/s – Type 2 backfill 2-year flow return frequency	· These flow regimes are used as the basis for the backfill design, except as noted in Section 3.6.2 · Flow velocities based on the Phase 2 Hydrodynamic Model (Attachment D of the Phase 2 IDR)
Backfill Material Types	Type 1, Type 2, Type 3	· Type 1 backfill material will be used in locations with estimated surface water velocities of 1.5 ft/s or less during a 2-year flow event, except as described in Section 3.6.2.1 · Type 2 backfill material will be used in areas with estimated surface water velocities above 1.5 ft/s during a 2-year flow event, except as described in Section 3.6.2.1 · Only Type 2 backfill material will be placed in near-shore areas not designated for RFW construction · Only Type 2 backfill material will placed in the navigation channel · Supporting side slopes for near-shore backfill, habitat layer backfill, and RFW construction areas will be constructed using Type 2 material · Base materials (depths of greater than 1 foot below the final backfill surface) for RFW construction areas will be constructed using Type 2 material · Type 5 backfill material will be used to provide a planting surface in restored RFW construction areas
Residuals sediment concentration triggers following dredging	1 mg/kg Tri+ PCBs 27 mg/kg Tri+ PCBs 500 mg/kg Total PCBs	· Phase 2 EPS · See the 2013 PSCP
Water depth after dredging	Varies	· Function of location in the river and dredging depths (range based on bathymetric data)
Flow velocities and flow return frequency – cap design	≤ 5 ft/s – Medium-velocity isolation cap > 5 ft/s – High-velocity isolation cap 100-year flow return frequency	· These flow regimes were used as the basis for the cap design (Attachment F of the 2011 FDR) · Flow velocities based on the Phase 2 Hydrodynamic Model (Attachment D of the Phase 2 IDR) · The basis for the flow return frequency related to the isolation cap design was set forth in the Phase 2 CDE
Caps in the navigation channel	High-velocity isolation caps with the top elevations of caps at or below 103.2 ft (NAVD88) in Reach 8 and at or below 86.7 ft (NAVD88) in Reach 6	· Phase 2 CDE
Maximum residual sediment concentration subject to capping	500 mg/kg Total PCBs	· Areas with residual total PCB concentrations greater than 500 mg/kg (which is approximately equivalent to 200 mg/kg Tri+ PCBs) will be subject to re-dredging (Phase 2 EPS) · See Attachment F of the 2011 FDR

Table 3-2
Basis of Design for Backfilling/Capping – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Isolation cap design parameters	See Attachment F of the 2011 FDR	· See Section 3.6.3

Notes:
1. References are defined in Section 6 of the 2013 FDR.
2. Acronyms and abbreviations are defined in Section 7 of the 2013 FDR.

Table 3-3
Basis of Design for Processed Sediment Transportation and Disposal – Phase 2, Year 3

Phase 2 Final Design Report for 2013
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Tonnage of material to be transported and disposed during Phase 2, Year 3	448,000 tons – Target Productivity	· Based on the minimum target production of 350,000 cy – Phase 2 EPS (EPA 2010b) · Assumes average processing facility output density of approximately 1.28 tons per *in situ* cy dredged (based on Phase 2, Year 1 data) · The actual tonnage of material will vary based on the volume of material dredged and the density of the dredged material after sediment processing
PCB concentration for waste disposal characterization	Varies	· Actual PCB concentrations will vary depending on dredge area and processing · Processed sediment and debris may be segregated as TSCA and Non-TSCA material for disposal at separate commercial disposal facilities permitted to accept the materials. The methodology for characterizing, segregating, and managing TSCA-regulated and non-TSCA materials for the purposes of transport and disposal will be specified in the 2013 TDP (Parsons 2013d).
Processed sediment shipping season	Early June to December 31 (~30 weeks)	· Initial shipments are assumed to begin 3 weeks after dredging is initiated to allow adequate volume to accumulate for load out and shipment · Based on the plan that all material will be shipped from processing facility by end of calendar year · Shipment of all staged sediment and debris by the end of the calendar year may be subject to an extension in the event that delays attributable to actions of the disposal facility operator or rail carriers prevent such removal by the end of the calendar year (Phase 2 EPS)
Available staging area capacity for processed material	Coarse Material: 116,000 cy Fine Material: 41,000 cy	· Constructed at the Processing Facility during Phase 1 and upgraded during 2011 and 2012 · Total material staged shall not exceed 130,000 cy (EPA 2012; unless otherwise approved by EPA)
Landfill destination	To be determined	· The processed materials will be transported by railroad to one or more authorized commercial disposal facilities · The selected disposal facility(ies) will be identified in the 2013 TDP
Delivery mode	Rail, using gondola rail cars	· Rail delivery in unit trains directly to selected disposal facility(ies) · Material will be packaged in rail cars by a method meeting DOT performance standards
Debris	Size limited and segregated from filter cake	· Debris is defined as any single piece of material greater than 4 feet in any length, or any single piece of material weighing more than 1 ton and less than 6 tons · Railcars loaded with debris will be designated so that they can be easily identified at the landfill
Moisture content of processed material	Pass paint filter test	· TSCA regulations (40 CFR 761) · Disposal facility requirements
RCRA designation of sediment	Non-Hazardous	· SSAP data

Notes:
1. References are defined in Section 6 of the 2013 FDR.
2. Acronyms and abbreviations are defined in Section 7 of the 2013 FDR.

Table 3-4
Certification Unit Areas and Design Volumes

Phase 2 Final Design Report for 2013
General Electric Company - Hudson River PCBs Superfund Site

Reach	Certification Unit (CU)	CU Area (acres) [1]	EoC Surface Volume (cy) [2,4]	Estimated PCB Mass (kg) [5]		Design Dredge Prism Volume (cy) [3,4]
				Total PCBs	Tri+ PCBs	
Reach 8	CU49	6.48	14,100	470	170	15,800
	CU55	5.16	12,400	540	150	12,200
	CU56	5.81	14,800	1,210	310	14,100
	CU57	5.44	13,600	420	110	13,900
	CU58	6.03	14,300	490	140	13,400
	CU59	4.02	6,200	280	60	6,300
	CU60	6.02	23,400	880	250	22,200
Reach 6	CU67	5.57	33,800	3,460	1,020	34,900
	CU68	5.27	26,200	3,050	810	26,100
	CU69	5.29	21,900	2,000	490	21,900
	CU70	5.35	26,200	1,950	520	26,400
	CU71	4.41	19,900	1,410	370	20,700
	CU72	5.51	16,300	820	210	16,800
	CU73	5.88	20,000	1,220	330	20,800
	CU74	4.80	12,800	760	190	13,000
	CU75	3.10	10,400	670	190	10,800
	CU76	6.46	30,400	1,660	470	30,500
	CU77	4.17	31,100	1,030	380	29,100
	CU78	2.66	17,500	480	190	18,000
TOTAL - CU49, CU55-CU60, CU67-CU78		**97.4**	**365,300**	**22,800**	**6,360**	**366,900**

Notes:

1. Certification Unit (CU) Area based on the area within the CU boundary limits and does not include adjustments associated with offsets/setbacks within the CU limits or engineering sideslopes outside the CU boundaries.

2. The Elevation of Contamination (EoC) surface was developed by Anchor QEA based on the Dredge Prism Development Steps included in the Phase 2 CDE and sediment PCB data (see Attachment A).

3. Design dredge prisms were developed by Parsons based on the Dredge Prism Development Steps included in the Phase 2 CDE and the EoC surface developed by Anchor QEA (see Attachment B).

4. Volumes for the EoC surface and the design dredge prisms are based on comparison with the existing bathymetry data, which is based on bathymetric surveys conducted in 2005 and 2006 for Reach 8 and 2011 and 2012 for Reach 6. The Design Dredge Prism Volumes include engineering sideslopes that are outside of the CU boundaries.

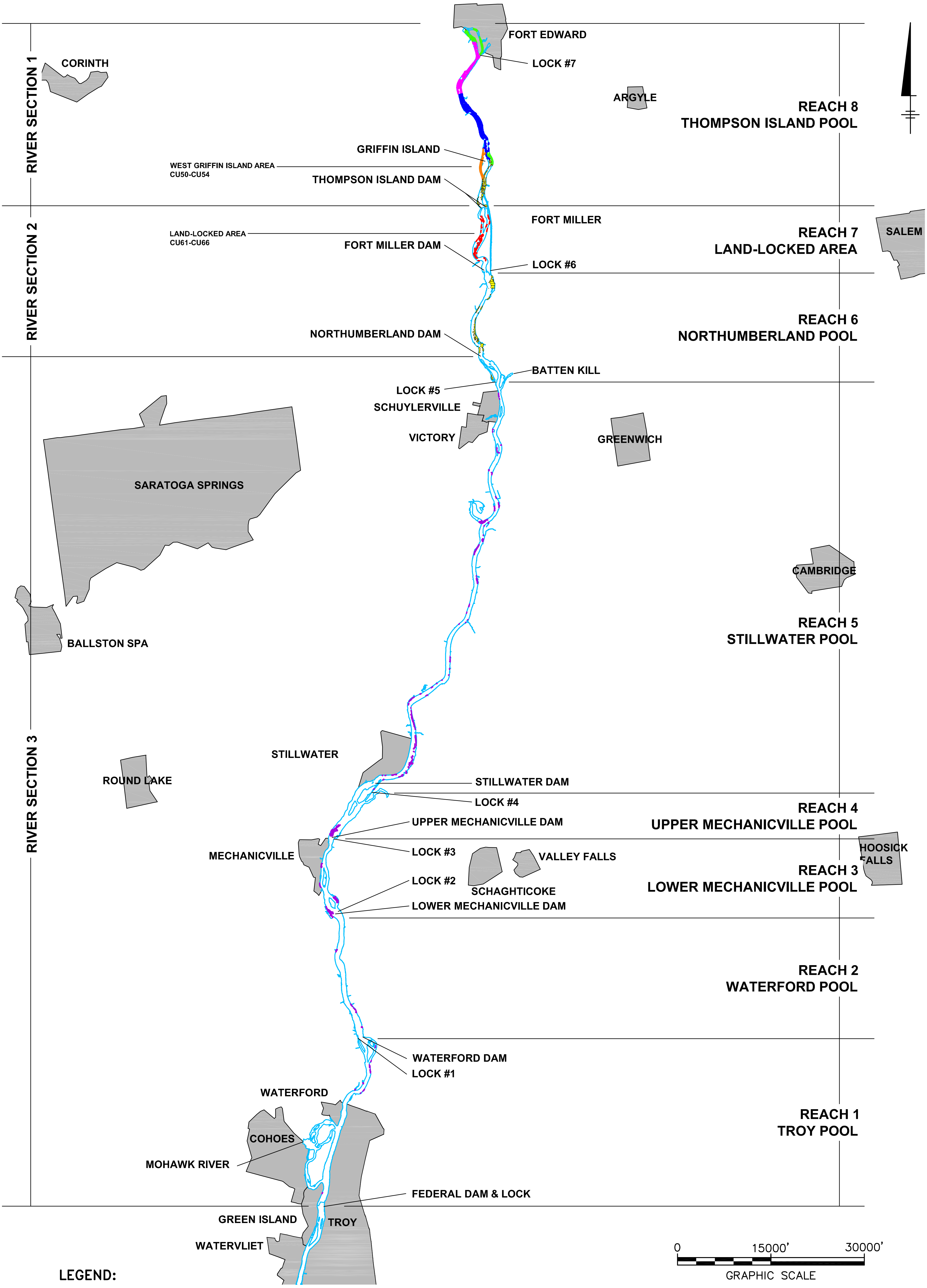
5. PCB mass based on method outlined in Chapter 7 of the EPS. Targeted mass based on dredge prism cut depth which is adjusted for engineering considerations.

ARCADIS

Figures

CITY: SYRACUSE, NY DIV/GROUP: 141/ENVCAD DB: L.POSENAUER LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
V:\ENVCAD\SYRACUSE\ACT\C\B0031087\0003\04800\2013FDR\31087B01.DWG LAYOUT: KEY MAP SAVED: 2/11/2013 9:14 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 2/11/2013 9:14 AM BY: POSENAUER, LISA

XREFS:
XBM-MAJR



LEGEND:

- PHASE 1 DREDGE AREA (CU01–CU08, CU17, CU18)
- PHASE 2, YEAR 1 DREDGE AREA (CU09–CU16, CU19–CU25)
- PHASE 2, YEAR 2 DREDGE AREA (CU26–CU48)
- PHASE 2, YEAR 3 (DESIGN: CU49, CU55–CU60, CU67–CU78)
- WEST GRIFFIN ISLAND AREA (CU50–CU54)
- LANDLOCKED AREA (CU61–CU66)
- REMAINDER OF PHASE 2 DREDGE AREAS
- INCORPORATED AREAS

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UPPER HUDSON RIVER

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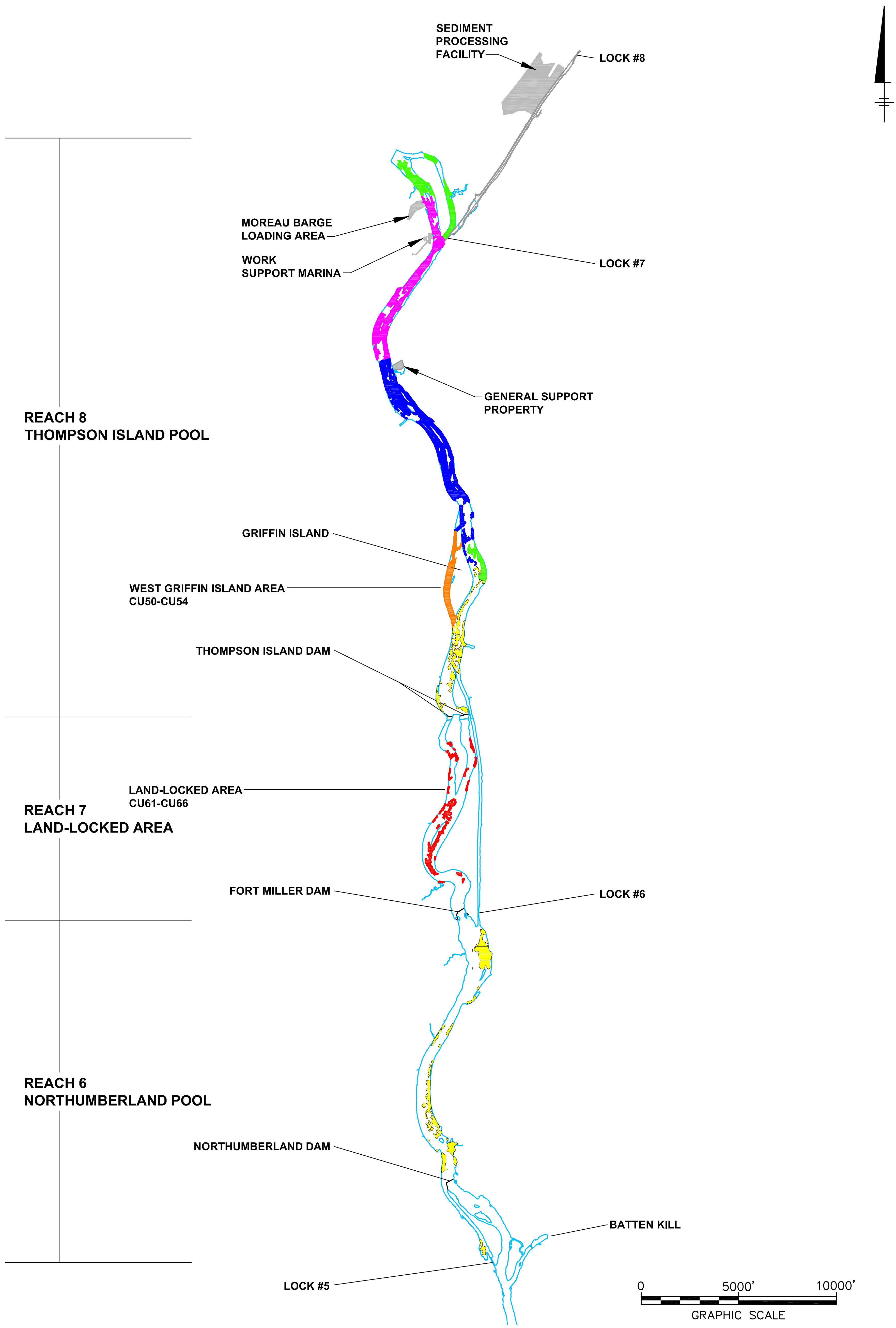
FIGURE
1-1



LEGEND:

- PHASE 1 DREDGE AREA (CU01–CU08, CU17, CU18)
- PHASE 2, YEAR 1 DREDGE AREA (CU09–CU16, CU19–CU25)
- PHASE 2, YEAR 2 DREDGE AREA (CU26–CU48)
- PHASE 2, YEAR 3 (DESIGN: CU49, CU55–CU60, CU67–CU78)
- WEST GRIFFIN ISLAND AREA (CU50–CU54)
- LANDLOCKED AREA (CU61–CU66)

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PHASE 2, YEAR 3 DREDGE AREAS

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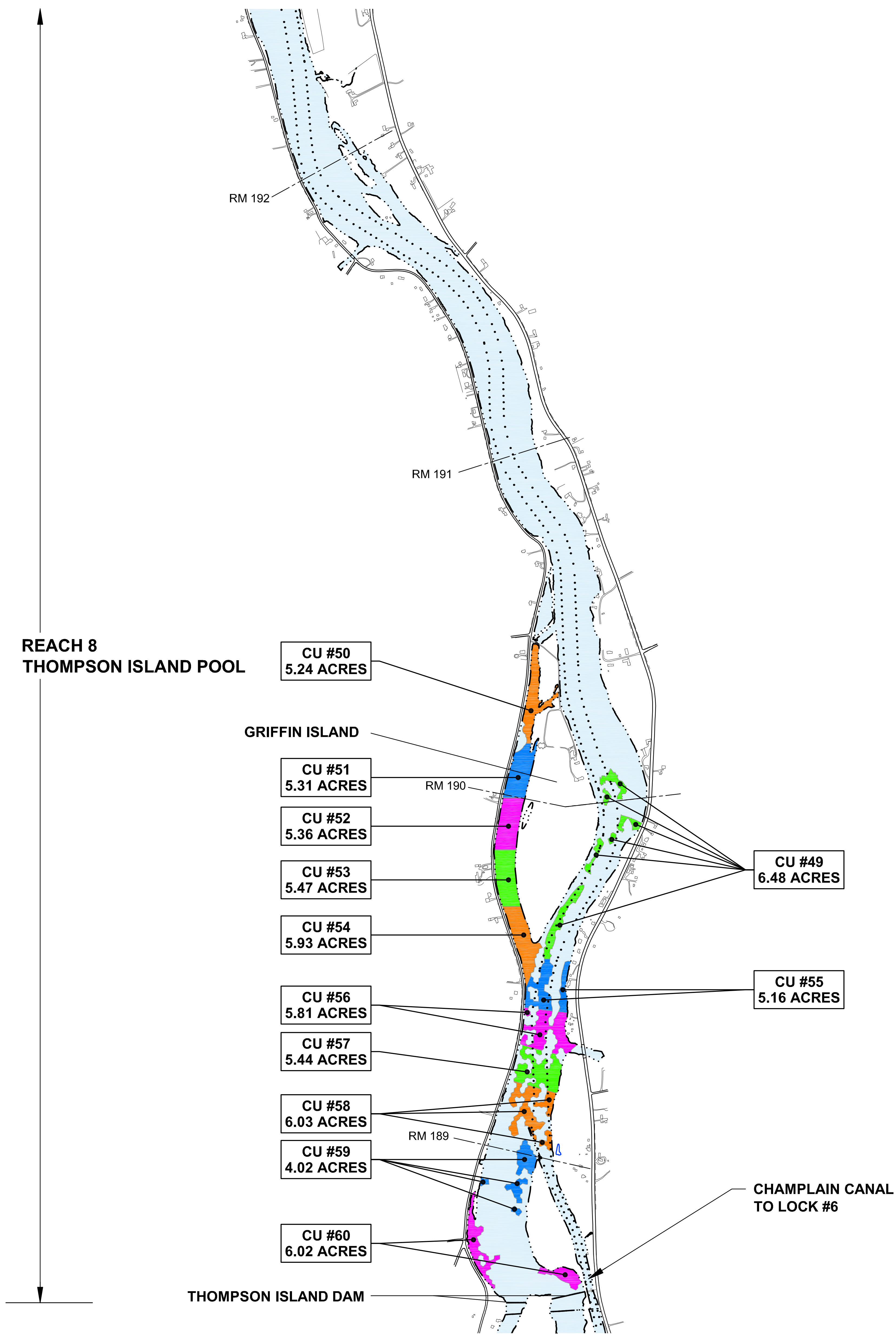
FIGURE
1-2

CITY: SYRACUSE, NY DIV/GROUP: ENVCAD DB: L.POSENAUER LD: L.POSENAUER PIC:(Opt) PM: C.GUEST TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
V:\ENVCAD\SYRACUSE\ACT\C\B0031087\0003\04800\2013FDR\31087B02.DWG LAYOUT: 1-3 SAVED: 2/11/2013 9:44 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 2/11/2013 9:52 AM BY: POSENAUER, LISA

XREFS:
XBM-MAJR
XBM-MINR
XRV-NC01
XRV-CU01



LEGEND:

SHORELINE

NAVIGATION CHANNEL

RIVER MILES

0 1500' 3000'

GRAPHIC SCALE

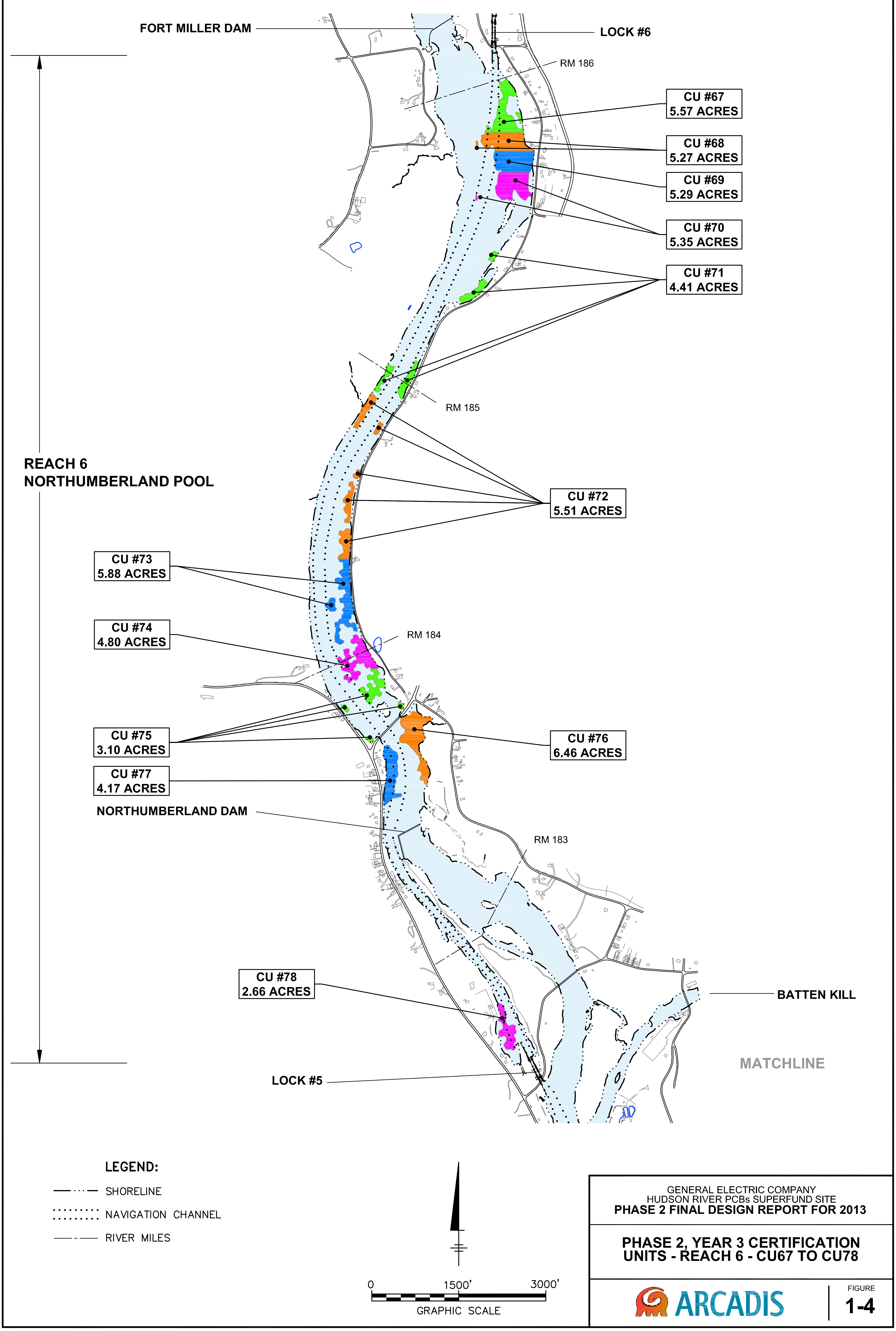
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
PHASE 2 FINAL DESIGN REPORT FOR 2013

PHASE 2, YEAR 3 CERTIFICATION UNITS - REACH 8 - CU49 TO CU60

ARCADIS

FIGURE
1-3

XREFS:
XBM-MAJR
XBM-MINR
XRV-NC01
XRV-CU01



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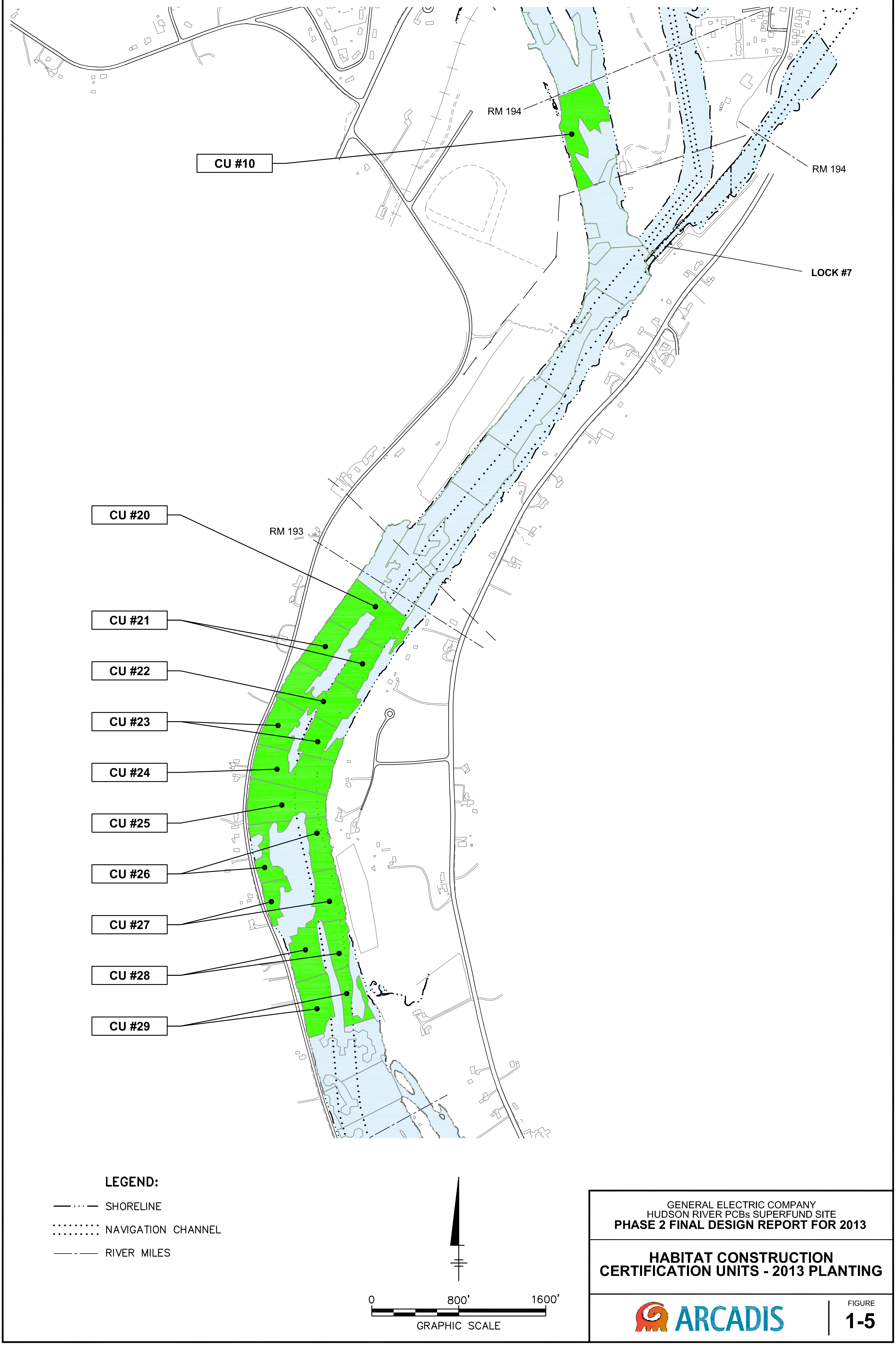
PHASE 2 FINAL DESIGN REPORT FOR 2013

PHASE 2, YEAR 3 CERTIFICATION UNITS - REACH 6 - CU67 TO CU78

ARCADIS

FIGURE
1-4

XREFS:
XBM-MAJR
XBM-MINR
XRV-NC01
XRV-CU01



LEGEND:

- SHORELINE
- NAVIGATION CHANNEL
- RIVER MILES

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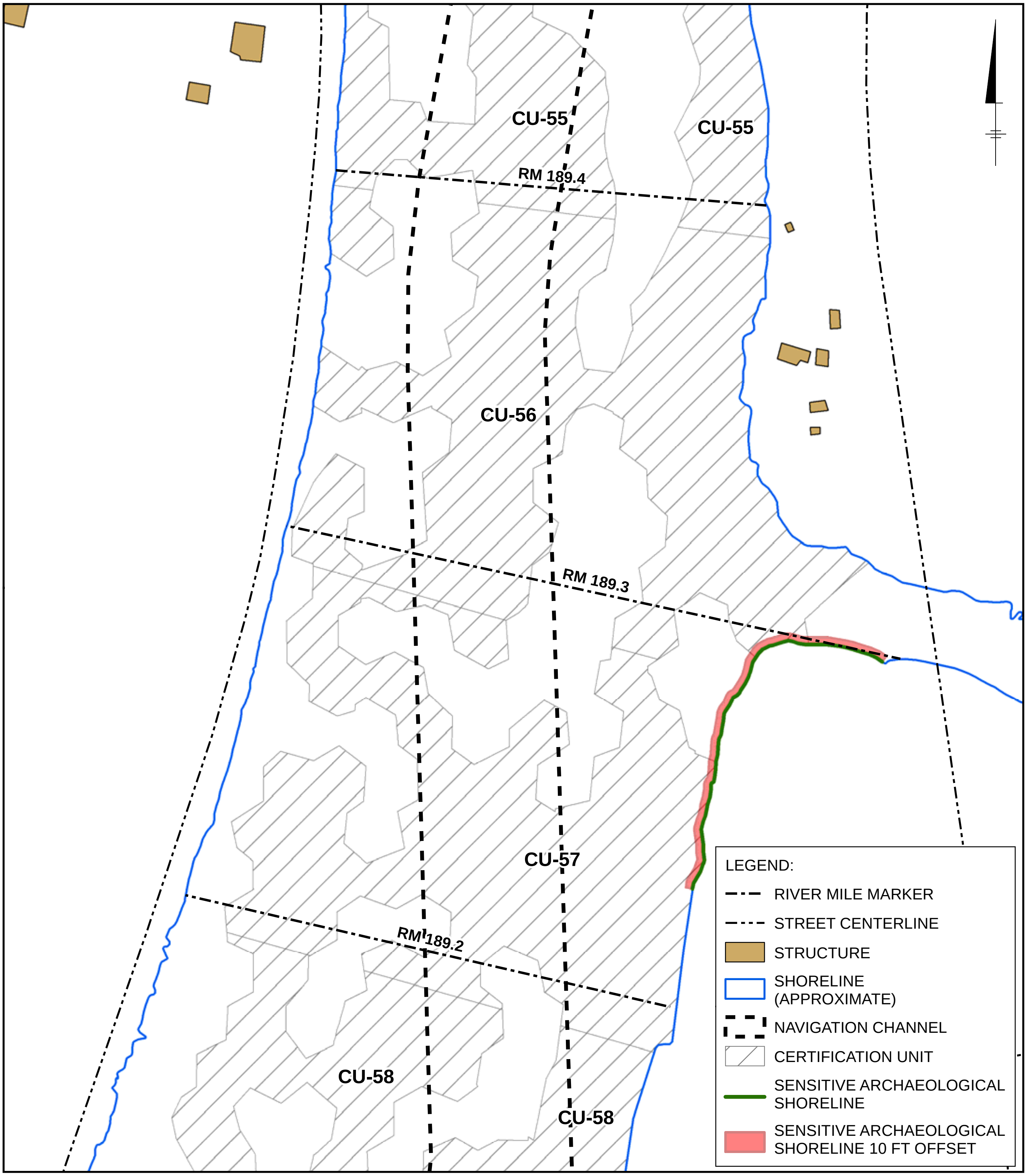
HUDSON RIVER PCBs SUPERFUND SITE
PHASE 2 FINAL DESIGN REPORT FOR 2013

HABITAT CONSTRUCTION CERTIFICATION UNITS - 2013 PLANTING

ARCADIS

FIGURE
1-5



NOTES:

1. SENSITIVE ARCHAEOLOGICAL SHORELINE PROVIDED BY URS.
2. A 10-FOOT DREDGING OFFSET WILL BE APPLIED FROM THE SENSITIVE ARCAHEOLOGICAL SHORELINE.

0 200 400 Feet

GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE

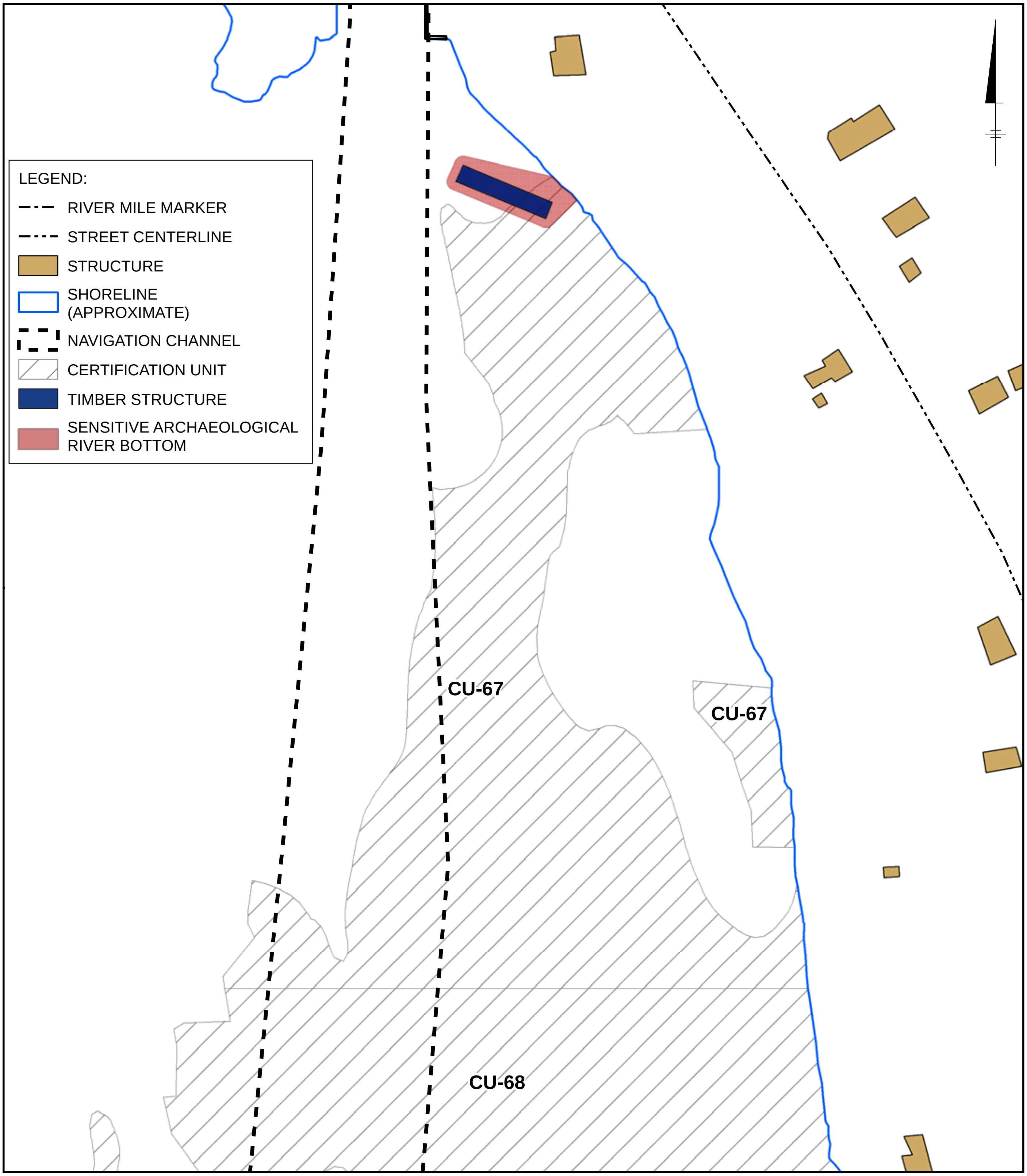
PHASE 2 FINAL DESIGN REPORT FOR 2013

SENSITIVE ARCHAEOLOGICAL SHORELINE - CU56 AND CU57

ARCADIS

FIGURE **2-1**

City: SYR Div/Group: 90 Created By: mkohberger Last Saved By: momeara
GE Hudson (B0031087.0003.04800)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\DredgePrismDevelopment\mxd\Arch Resource Areas_offset - CU56and57_67_73to75_77.mxd 1/17/2013 5:47:48 PM



NOTES:

1. LOCATION OF TIMBER STRUCTURE PROVIDED BY URS IN JANUARY 2013.

2. SENSITIVE ARCHAEOLOGICAL RIVER BOTTOM ESTABLISHED BY APPLYING A 10-FOOT BUFFER AROUND THE TIMBER STRUCTURE AND IN THE AREA BETWEEN THE TIMBER STRUCTURE AND THE SHORELINE. NO DREDGING WILL BE CONDUCTED WITHIN THE SENSITIVE ARCHAEOLOGICAL RIVER BOTTOM AREA.

0 200 400 Feet

GRAPHIC SCALE

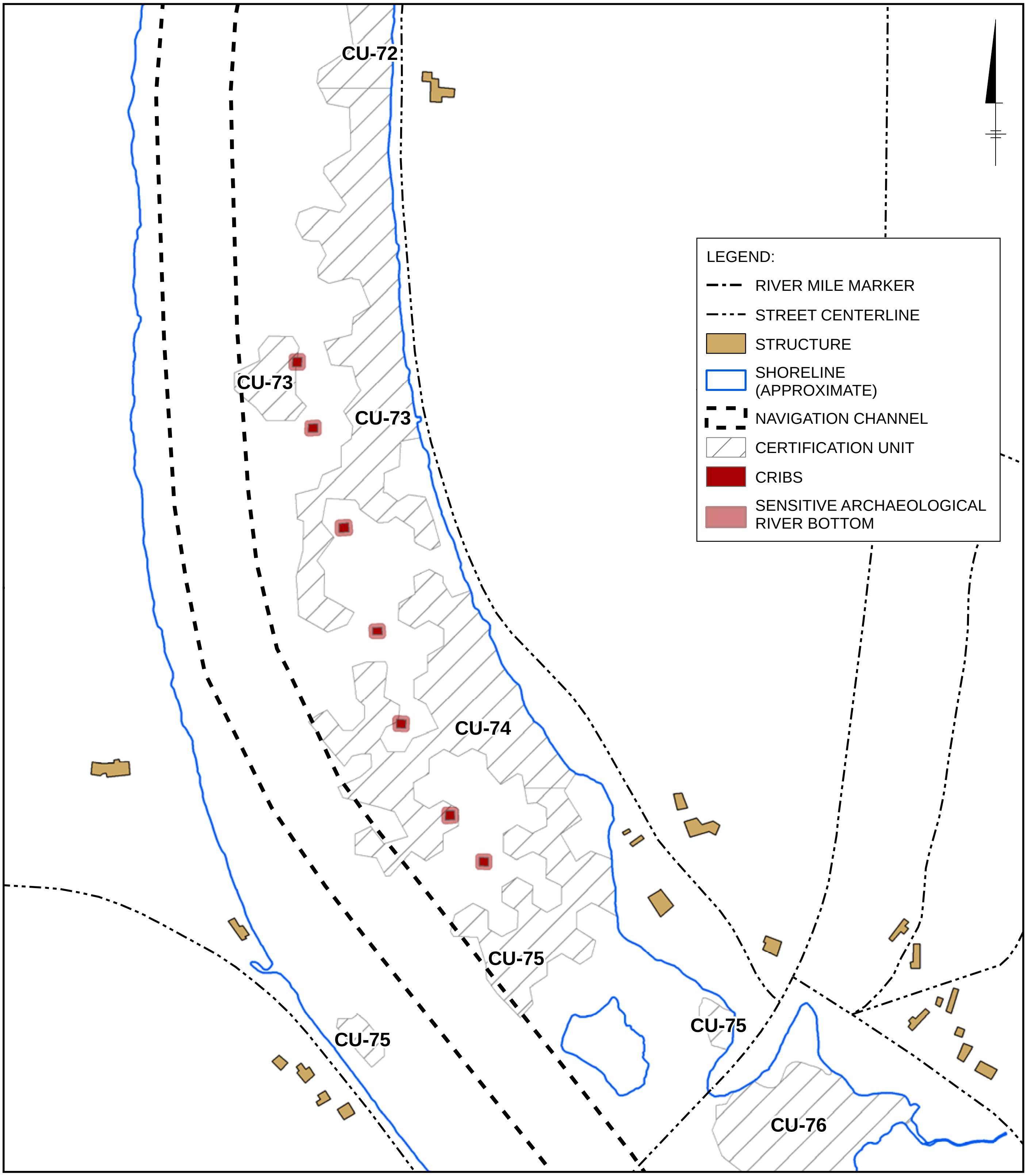
GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE

PHASE 2 FINAL DESIGN REPORT FOR 2013

SENSITIVE ARCHAEOLOGICAL RIVER BOTTOM - CU67

ARCADIS

FIGURE
2-2



NOTES:

1. LOCATIONS OF CRIBS PROVIDED BY URS IN JANUARY 2013.
2. SENSITIVE ARCHAEOLOGICAL RIVER BOTTOM ESTABLISHED BY APPLYING A 10-FOOT BUFFER AROUND THE CRIBS. NO DREDGING WILL BE CONDUCTED WITHIN THE SENSITIVE ARCHAEOLOGICAL RIVER BOTTOM AREA.

0 200 400 Feet

GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE

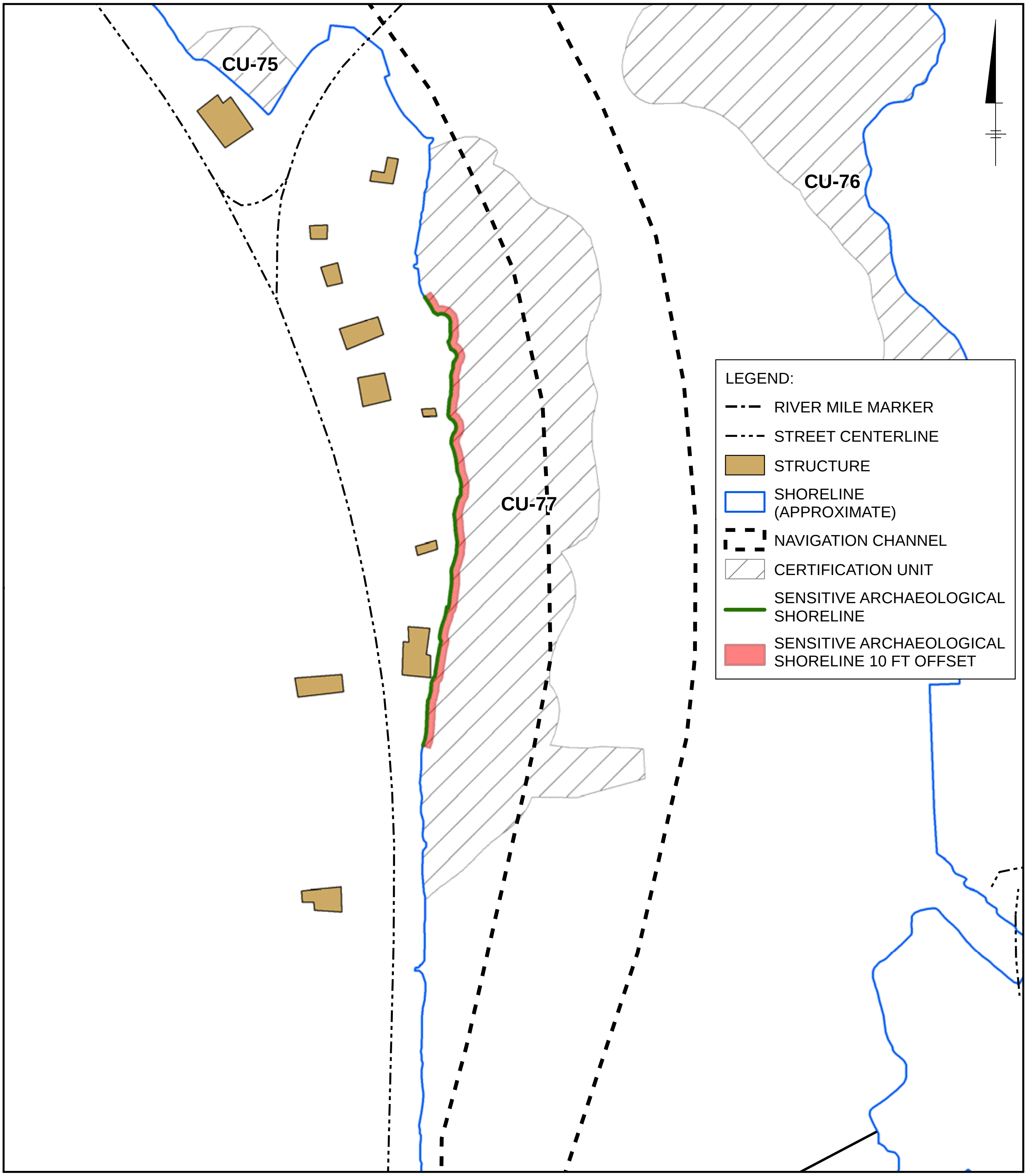
PHASE 2 FINAL DESIGN REPORT FOR 2013

SENSITIVE ARCHAEOLOGICAL RIVER BOTTOM - CU73, CU74, CU75

ARCADIS

FIGURE **2-3**

City: SYR Div/Group: 90 Created By: mkohberger Last Saved By: momeara
GE Hudson (B0031087.0003.04800)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\DredgePrismDevelopment\mxd\Arch Resource Areas_offset - CU56and57_67_73to75_77.mxd 2/12/2013 10:47:12 AM



NOTES:

1. SENSITIVE ARCHAEOLOGICAL SHORELINE PROVIDED BY URS IN JANUARY 2013.
2. A 10-FOOT DREDGING OFFSET WILL BE APPLIED FROM SENSITIVE ARCHAEOLOGICAL SHORELINE.

0 200 400 Feet

GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE

PHASE 2 FINAL DESIGN REPORT FOR 2013

SENSITIVE ARCHAEOLOGICAL SHORELINE - CU 77

ARCADIS

FIGURE **2-4**

City: SYR Div/Group: 90 Created By: mkohberger Last Saved By: momeara
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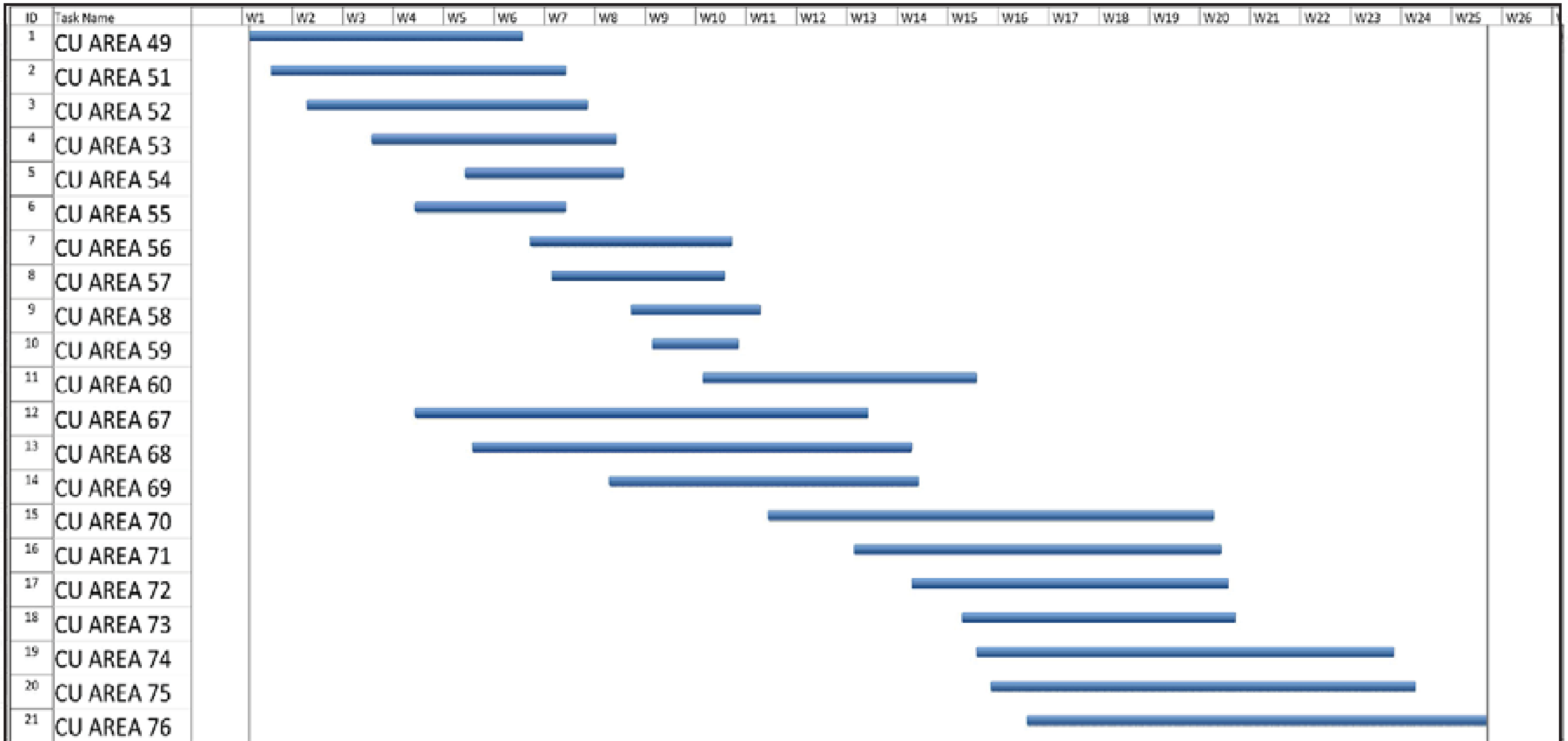
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\DredgePrismDevelopment\mxd\Arch Resource Areas_offset - CU56and57_67_73to75_77.mxd 1/17/2013 5:47:48 PM

Figure 3-1 Forecast 2013 Dredging Plan



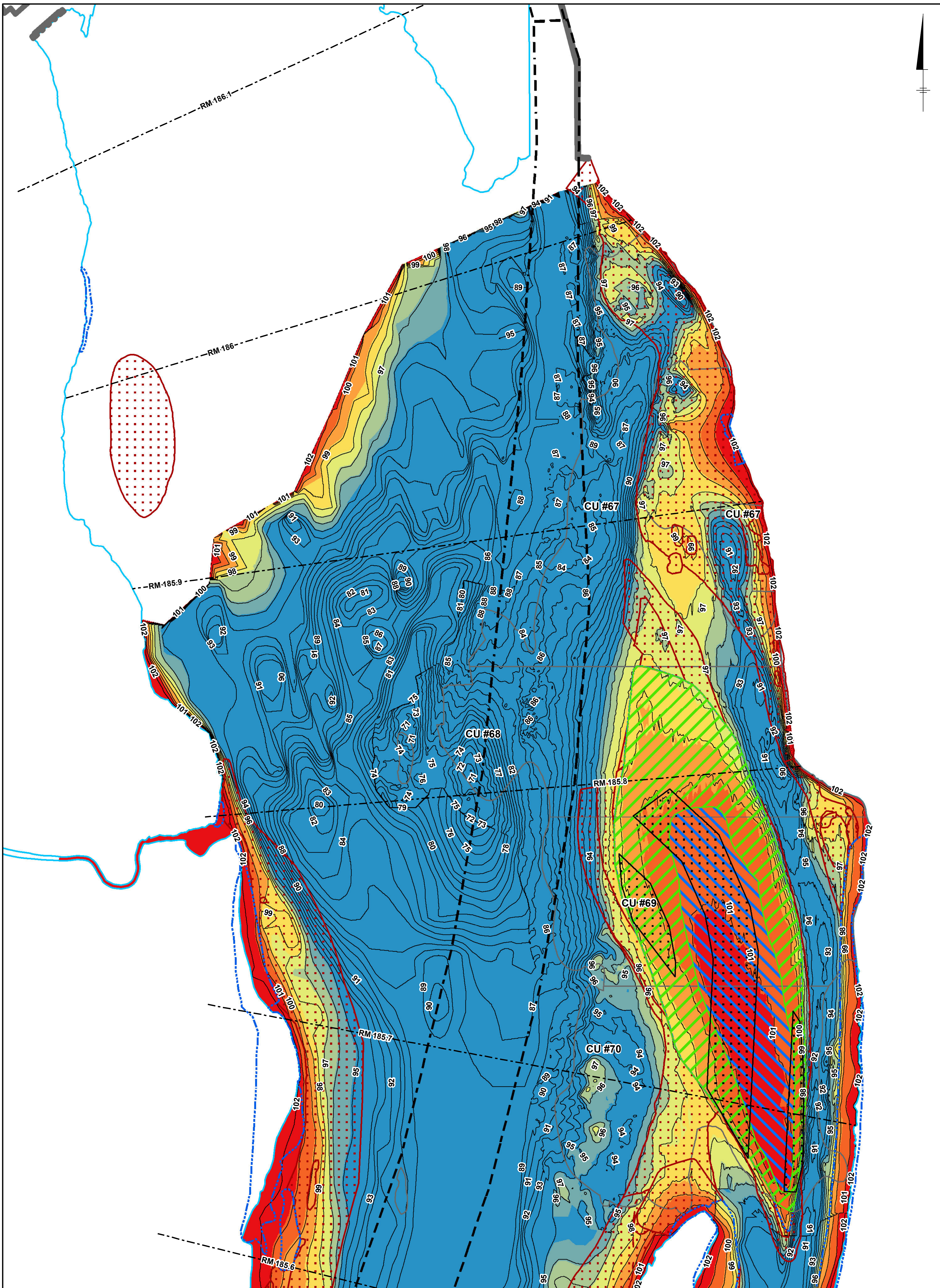
Estimated dredge duration (Includes 1st & 2nd Pass)

Schedule Assumptions:

Three 5cy dredges and Two 2cy dredges
Average 5cy dredge production rate 1,500 cy/day
Average 2cy dredge production rate 750 cy/day
2nd Pass removes 30% of the 1st Pass volume in each CU
Dredging occurs 24hrs/day, 6 days/week

Notes:

1. The schedule and sequence shown are estimated based on review of prior experience and input from the Dredging Contractor and are subject to revision.
2. The actual number of CU's that will be dredged in Phase 2, Year 3 and the dredging sequence/ schedule will vary based on conditions encountered in the field.



LEGEND:

- RIVER MILE MARKER
- ACCESS DREDGING AREAS
- NAVIGATION CHANNEL
- RFW DELINEATION - WATER LILY
- RFW DELINEATION - WILD RICE
- RIVERINE FRINGING WETLAND DELINEATION (ANCHOR QEA, 2009)
- SUBMERGED AQUATIC VEGETATION AREA
- CERTIFICATION UNIT
- BATHYMETRY CONTOUR - 1 FT (NAVD88)
- SHORELINE (APPROXIMATE)

WATER DEPTHS (FT):

- <1
- ≥ 1 - <2
- ≥ 2 - <3
- ≥ 3 - <4
- ≥ 4 - <5
- ≥ 5 - <6
- ≥ 6 - <7
- ≥ 7

0 200 400 Feet
GRAPHIC SCALE

NOTE:
1. BATHYMETRY ELEVATIONS PROVIDED BY ANCHOR QEA, LLC.
2. WATER DEPTHS BASED ON A WATER SURFACE ELEVATION OF 102.1 FT NAVD88.

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
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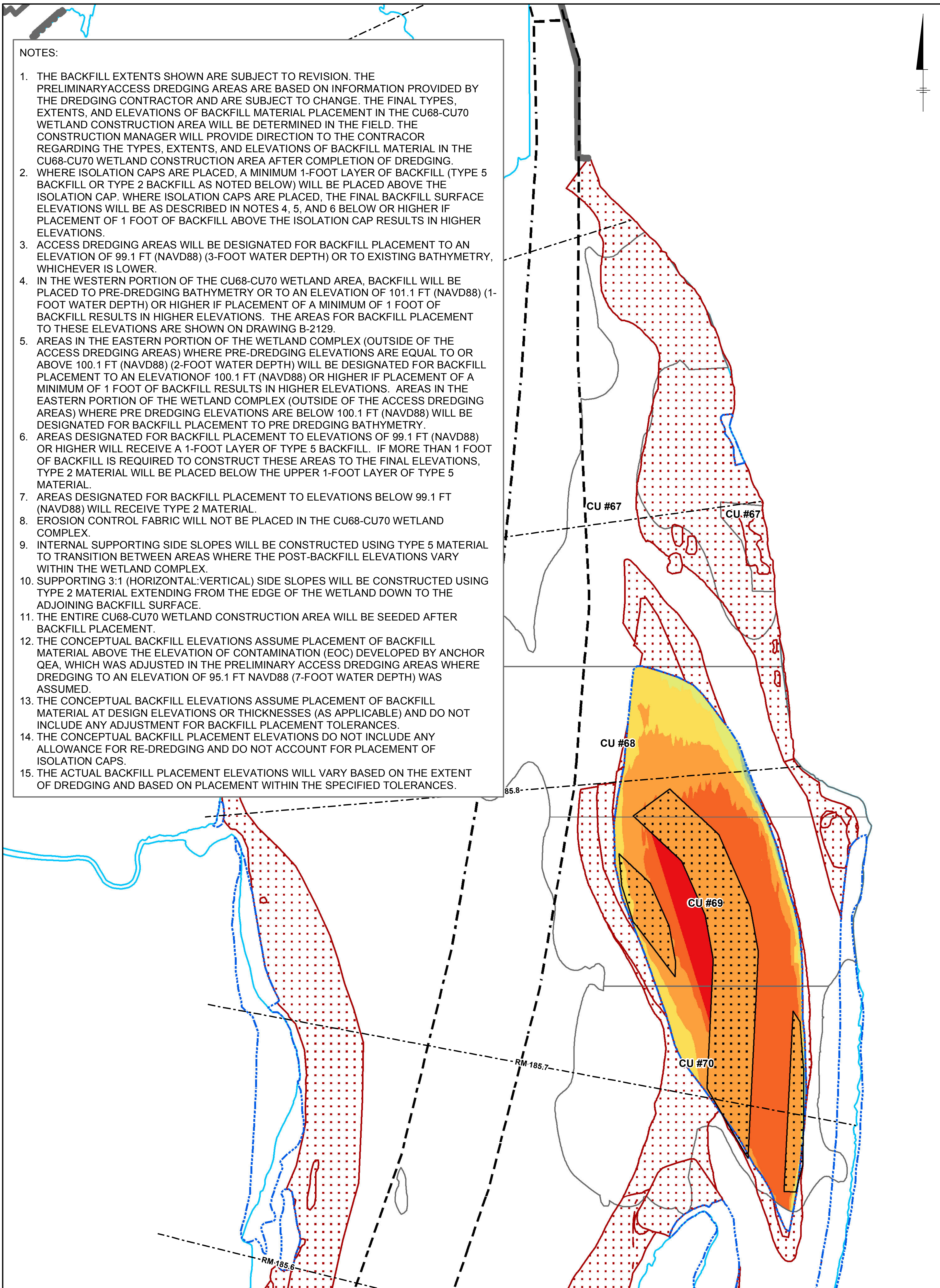
EXISTING WATER DEPTHS
CU67 - CU70

ARCADIS

FIGURE
3-2

City: SYR Div/Group: 90 Created By: mkohberger Last Saved By: browne
GE Hudson (B0031087.0001.03100)
R:\GE_GIS\GE_HudsonRiver\Phase2_FDR\BackfillDesign\mxd\BackfillWaterDepth - Hotspot28_Wetland_042413.mxd 4/25/2013 5:31:11 PM (Page 1 of 2)



NOTES:

1. THE BACKFILL EXTENTS SHOWN ARE SUBJECT TO REVISION. THE PRELIMINARYACCESS DREDGING AREAS ARE BASED ON INFORMATION PROVIDED BY THE DREDGING CONTRACTOR AND ARE SUBJECT TO CHANGE. THE FINAL TYPES, EXTENTS, AND ELEVATIONS OF BACKFILL MATERIAL PLACEMENT IN THE CU68-CU70 WETLAND CONSTRUCTION AREA WILL BE DETERMINED IN THE FIELD. THE CONSTRUCTION MANAGER WILL PROVIDE DIRECTION TO THE CONTRACOR REGARDING THE TYPES, EXTENTS, AND ELEVATIONS OF BACKFILL MATERIAL IN THE CU68-CU70 WETLAND CONSTRUCTION AREA AFTER COMPLETION OF DREDGING.
2. WHERE ISOLATION CAPS ARE PLACED, A MINIMUM 1-FOOT LAYER OF BACKFILL (TYPE 5 BACKFILL OR TYPE 2 BACKFILL AS NOTED BELOW) WILL BE PLACED ABOVE THE ISOLATION CAP. WHERE ISOLATION CAPS ARE PLACED, THE FINAL BACKFILL SURFACE ELEVATIONS WILL BE AS DESCRIBED IN NOTES 4, 5, AND 6 BELOW OR HIGHER IF PLACEMENT OF 1 FOOT OF BACKFILL ABOVE THE ISOLATION CAP RESULTS IN HIGHER ELEVATIONS.
3. ACCESS DREDGING AREAS WILL BE DESIGNATED FOR BACKFILL PLACEMENT TO AN ELEVATION OF 99.1 FT (NAVD88) (3-FOOT WATER DEPTH) OR TO EXISTING BATHYMETRY, WHICHEVER IS LOWER.
4. IN THE WESTERN PORTION OF THE CU68-CU70 WETLAND AREA, BACKFILL WILL BE PLACED TO PRE-DREDGING BATHYMETRY OR TO AN ELEVATION OF 101.1 FT (NAVD88) (1-FOOT WATER DEPTH) OR HIGHER IF PLACEMENT OF A MINIMUM OF 1 FOOT OF BACKFILL RESULTS IN HIGHER ELEVATIONS. THE AREAS FOR BACKFILL PLACEMENT TO THESE ELEVATIONS ARE SHOWN ON DRAWING B-2129.
5. AREAS IN THE EASTERN PORTION OF THE WETLAND COMPLEX (OUTSIDE OF THE ACCESS DREDGING AREAS) WHERE PRE-DREDGING ELEVATIONS ARE EQUAL TO OR ABOVE 100.1 FT (NAVD88) (2-FOOT WATER DEPTH) WILL BE DESIGNATED FOR BACKFILL PLACEMENT TO AN ELEVATIONOF 100.1 FT (NAVD88) OR HIGHER IF PLACEMENT OF A MINIMUM OF 1 FOOT OF BACKFILL RESULTS IN HIGHER ELEVATIONS. AREAS IN THE EASTERN PORTION OF THE WETLAND COMPLEX (OUTSIDE OF THE ACCESS DREDGING AREAS) WHERE PRE DREDGING ELEVATIONS ARE BELOW 100.1 FT (NAVD88) WILL BE DESIGNATED FOR BACKFILL PLACEMENT TO PRE DREDGING BATHYMETRY.
6. AREAS DESIGNATED FOR BACKFILL PLACEMENT TO ELEVATIONS OF 99.1 FT (NAVD88) OR HIGHER WILL RECEIVE A 1-FOOT LAYER OF TYPE 5 BACKFILL. IF MORE THAN 1 FOOT OF BACKFILL IS REQUIRED TO CONSTRUCT THESE AREAS TO THE FINAL ELEVATIONS, TYPE 2 MATERIAL WILL BE PLACED BELOW THE UPPER 1-FOOT LAYER OF TYPE 5 MATERIAL.
7. AREAS DESIGNATED FOR BACKFILL PLACEMENT TO ELEVATIONS BELOW 99.1 FT (NAVD88) WILL RECEIVE TYPE 2 MATERIAL.
8. EROSION CONTROL FABRIC WILL NOT BE PLACED IN THE CU68-CU70 WETLAND COMPLEX.
9. INTERNAL SUPPORTING SIDE SLOPES WILL BE CONSTRUCTED USING TYPE 5 MATERIAL TO TRANSITION BETWEEN AREAS WHERE THE POST-BACKFILL ELEVATIONS VARY WITHIN THE WETLAND COMPLEX.
10. SUPPORTING 3:1 (HORIZONTAL:VERTICAL) SIDE SLOPES WILL BE CONSTRUCTED USING TYPE 2 MATERIAL EXTENDING FROM THE EDGE OF THE WETLAND DOWN TO THE ADJOINING BACKFILL SURFACE.
11. THE ENTIRE CU68-CU70 WETLAND CONSTRUCTION AREA WILL BE SEEDED AFTER BACKFILL PLACEMENT.
12. THE CONCEPTUAL BACKFILL ELEVATIONS ASSUME PLACEMENT OF BACKFILL MATERIAL ABOVE THE ELEVATION OF CONTAMINATION (EOC) DEVELOPED BY ANCHOR QEA, WHICH WAS ADJUSTED IN THE PRELIMINARY ACCESS DREDGING AREAS WHERE DREDGING TO AN ELEVATION OF 95.1 FT NAVD88 (7-FOOT WATER DEPTH) WAS ASSUMED.
13. THE CONCEPTUAL BACKFILL ELEVATIONS ASSUME PLACEMENT OF BACKFILL MATERIAL AT DESIGN ELEVATIONS OR THICKNESSES (AS APPLICABLE) AND DO NOT INCLUDE ANY ADJUSTMENT FOR BACKFILL PLACEMENT TOLERANCES.
14. THE CONCEPTUAL BACKFILL PLACEMENT ELEVATIONS DO NOT INCLUDE ANY ALLOWANCE FOR RE-DREDGING AND DO NOT ACCOUNT FOR PLACEMENT OF ISOLATION CAPS.
15. THE ACTUAL BACKFILL PLACEMENT ELEVATIONS WILL VARY BASED ON THE EXTENT OF DREDGING AND BASED ON PLACEMENT WITHIN THE SPECIFIED TOLERANCES.

LEGEND:

- RIVER MILE MARKER
- ACCESS DREDGING AREAS
- NAVIGATION CHANNEL
- RIVERINE FRINGING WETLAND DELINEATION (ANCHOR QEA, 2009)
- SUBMERGED AQUATIC VEGETATION AREA
- CERTIFICATION UNIT
- SHORELINE (APPROXIMATE)

CONCEPTUAL POST-BACKFILL WATER DEPTHS (FT)

(WATER DEPTHS BASED ON A 102.1 FT NAVD88 SURFACE WATER ELEVATION)

- ≤1
- >1 - ≤ 2
- >2 - ≤ 3
- >3 - ≤ 4
- >4 - ≤ 5
- >5 - ≤ 6
- >6 - ≤ 7
- >7

0 200 400 Feet

GRAPHIC SCALE

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HUDSON RIVER PCBs SUPERFUND SITE
PHASE 2 FINAL DESIGN REPORT FOR 2013

CU68 - CU70 WETLAND AREA CONCEPTUAL POST-BACKFILL PLACEMENT WATER DEPTHS

ARCADIS

FIGURE
3-3