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Phase 2 Final Design Report for Reach 7 (the Landlocked Area)

Hudson River PCBs Superfund Site

Revised June 2014

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Hudson River PCBs Superfund Site

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1. Introduction

This Phase 2 Final Design Report for Reach 7 (Reach 7 FDR), prepared on behalf of the General Electric Company (GE), presents the final design for Phase 2 dredging to be conducted in Reach 7 (also referred to as the Landlocked Area), 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 the Hudson River PCBs Superfund Site (the Site) in 2002 (EPA 2002). This Reach 7 FDR constitutes a revised version of the Reach 7 FDR, which was initially submitted on October 30, 2013 and revised and re-submitted on March 5, 2014. This revised version reflects comments from and discussions with EPA regarding those prior versions.

This report includes the design for dredging Certification Unit (CU) 61 through CU66, which encompass approximately 29 acres. Reach 7 is located in River Section 2 of the Upper Hudson River between Thompson Island Dam (East and West) at approximately River Mile (RM) 188.5 and the Fort Miller Dam at approximately RM 186.2. Reach 7 is "landlocked" by these dams, meaning that it is not directly accessible by water from the navigable channel of the Hudson River and Champlain Canal system. 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 CU61 through CU66 in Reach 7 in relation to the other CUs, Lock 7, Lock 6, Thompson Island Dam, Fort Miller Dam, and the Fort Edward Sediment Processing Facility. Figure 1-3 shows CU61 through CU66 in Reach 7.

It is anticipated that dredging will be conducted in Reach 7 during Phase 2, Year 4 (in 2014), concurrent with dredging in other reaches of the river. This approach is consistent with the Revised Engineering Performance Standards for Phase 2 (Phase 2 EPS; EPA 2010a), which allow for simultaneous dredging in multiple areas of the river to increase productivity.

This Reach 7 FDR has been prepared pursuant to the 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 in accordance with the Remedial Design Work Plan (RD Work Plan; Blasland, Bouck & Lee, Inc. [BBL] 2003a) attached 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), and the Phase 2 Final Design Reports for previous years of

Phase 2 (ARCADIS 2011, 2012, 2013) and EPA-approved addenda to those reports. This Reach 7 FDR is being submitted separately from other design submittals covering anticipated 2014 activities (e.g., the Phase 2 Final Design Report for CU85 through CU96 [CU85-CU96 FDR; ARCADIS 2014]) because activities in the Landlocked Area, notably relating to transporting material from this reach, will necessarily differ to some extent from those in the main stem of the river due to the fact that the Landlocked Area is not directly accessible by water from the navigable channel of the Hudson River and Champlain Canal system.

This report has also been developed to be consistent with the 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 in March 2009 and August 2011. 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 2010b) 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); and
- Attachment F: Certification Unit Completion Approval/Certification Forms for Phase 2 (Phase 2 CU Certification Forms).

This report also references, where appropriate, other documents that have been submitted separately to EPA, including the following:

- The Remedial Action Work Plan for Phase 2 Dredging and Facility Operations in 2014 (2014 RAWP; Parsons 2014a) and its appendices, which include the Phase 2 Transportation and Disposal Plan for 2014 (2014 TDP; Parsons 2014b) (Appendix C to the 2014 RAWP) and the Phase 2 Performance Standards Compliance Plan for 2014 (2014 PSCP; GE 2014) (Appendix D to the 2014 RAWP), as approved by EPA;

- The Remedial Action Work Plan for Reach 7 – Landlocked Area (Reach 7 RAWP; Parsons 2014c), as approved by EPA, and the appendices to that work plan, which include (a) the Phase 2 Construction Plan for Reach 7 Isthmus Transload Area and (b) the Phase 2 Construction Plan for the Landlocked Barge Loading Area (both of which were submitted to EPA prior to the Reach 7 RAWP itself), and will include (c) the Phase 2 Demobilization and Restoration Plan for Landlocked Area (which will be submitted separately once the extent of demobilization and restoration is known). In addition, the Reach 7 RAWP incorporates, as appropriate, the requirements of the appendices to the 2014 RAWP; and

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

The remainder of this report is organized as summarized in Table 1-1 below.

Table 1-1 Report Organization

Section	Description
Section 2: Landlocked Area Approach	Provides a summary of an evaluation of dredged material transport alternatives and describes the dredging and material transport approach for the Landlocked Area.
Section 3: Design Supporting Information – Reach 7	Summarizes information used to support the design for the Landlocked Area dredging operations.
Section 4: Design Summary – Reach 7	Summarizes the design for the Landlocked Area dredging operations and the habitat construction design associated with the Landlocked Area dredge areas.
Section 5: Contract Summary and Remedial Action Implementation – Reach 7	Summarizes the contracts for implementing the dredging operations and related activities for the Landlocked Area, describes the remedial action submittals for that work, and references the schedule for implementation of the remedial action activities in the Landlocked Area.

Section	Description
Section 6: References	Provides a list of references cited in this report.
Section 7: Acronyms and Abbreviations	Provides the definitions of acronyms and abbreviations used in this report.
Tables	Provides the tables referenced in this report.
Figures	Provides the figures referenced in this report.
Attachments	Provides the attachments referenced in this report.
Appendices	Provides the drawings and specifications referenced in this report.

2. Landlocked Area Dredging Approach

This section presents an overview of the approach for dredging and material transport operations associated with the Landlocked Area.

The Landlocked Area presents a number of operational challenges different from those found in the main stem of the river. The key challenge will be the transportation of dredged sediments from the Landlocked Area, which is a critical factor that affects many other aspects of the project. Because the Landlocked Area is not directly accessible by water from the navigable channel of the Hudson River and Champlain Canal system, the material transport operations for this area will require additional activities beyond those that have been implemented in other areas of the river. The RD Work Plan, which is part of the RD AOC, recognized (on page 3-9) that the specific manner by which dredged material would be transported from the Landlocked Area would be determined during design.

Based on previous discussions with EPA, an evaluation was performed to review potential dredged material transport alternatives associated with the dredging operations to be conducted in Reach 7 and to identify a practicable and effective solution for completing the work in this portion of the river. A summary of this evaluation is presented below, followed by a description of the approach for dredging and material transport operations associated with the Landlocked Area.

2.1 Evaluation of Dredged Material Transport Options

Dredged material transport options for transport from the Landlocked Area were previously evaluated as part of the Phase 2 IDR. As part of the Phase 2 IDR, a conceptual sediment transfer operation was proposed to move dredged material from the Landlocked Area over a narrow strip of land at the northern end of Reach 7 (isthmus) to load hopper barges in the “land-cut” section of the Champlain Canal. Under this concept, barges containing mechanically dredged sediment would be staged on the west side of the transfer area and the dredged sediments and debris would be transferred via a crane/large excavator or conveyor to receiving hopper barges staged on the east side of the transfer area in the land-cut portion of the canal.

The approach for dredged material transport from the Landlocked Area was further evaluated to identify the most practicable and effective solution for completing the work in this portion of the river. This additional evaluation considered a number of alternative scenarios to transfer the dredged material out of the Landlocked Area, including both

mechanical and hydraulic transport options. The alternatives considered during this evaluation were as follows:

- Alternative A: Mechanical transloading of dredged material from barges in the Landlocked Area of the river to barges in the land-cut portion of the canal east of the Landlocked Area, similar to the approach presented in the Phase 2 IDR. This alternative would include river access and backfill/cap material loading from a separate property.

- Alternative B: Mechanical transfer of dredged material to upland areas east of the Landlocked Area for staging and handling, followed by transfer of the dredged material to barges in the land-cut portion of the canal.

- Alternative C: Mechanical transfer of dredged material to barges in Reach 8 north of Thompson Island Dam.

- Alternative D: Hydraulic transfer of mechanically dredged material to hopper barges located in the land-cut portion of the canal east of the Landlocked Area, in Reach 8 north of Thompson Island Dam, or in Reach 6 south of Fort Miller Dam.

- Alternative E: Hydraulic transport of dredged material from the Landlocked Area directly to the existing Sediment Processing Facility.

- Alternative F: Mechanical or hydraulic transfer of dredged material to a temporary remote dewatering/staging area on land adjacent to the Landlocked Area, followed by truck transport to the Sediment Processing Facility.

Attachment G presents an evaluation of these dredged material transport options. As discussed in Attachment G, this evaluation indicated that Alternative A is the most practicable option to address the challenges and complexities associated with dredged material transport from the Landlocked Area.

Alternative A was not initially selected as the proposed dredged material transport alternative for the Landlocked Area as presented in the initial version of this Reach 7 FDR in October 2013. However, following that submittal, GE met with EPA and others to discuss the proposed approach and gathered additional input from contractors regarding the feasibility of implementing a transloading approach. Based on these

discussions, Alternative A is now considered the most practicable approach for implementing the project. Alternative A was selected based on the following factors:

- Dredged materials would be transported by barge to the Sediment Processing Facility consistent with the current dredged material transport approach being used in other portions of the river. This approach avoids the use of trucks to transport dredged materials, reducing potential traffic on local roadways.

- The existing Sediment Processing Facility will be used to dewater the dredged sediments. This approach avoids the need to develop a separate property to conduct sediment dewatering.

- By using two machines to transfer the sediment across the isthmus at the northern portion of the Landlocked Area, the transfer operation could be situated on a wider portion of the isthmus, thereby allowing for widening of the canal to the west. This alleviates the concern relative to the impacts to Route 4 related to widening the canal to the east and limits the widening length to a barge mooring area, not a barge passing lane, which would be a much more significant widening.

- Shoreline and upland areas that could be used for material handling are present between the Landlocked Area and the land-cut portion of the canal.

- Widening of the land-cut canal may be challenging, but is practicable using conventional excavating equipment. After access dredging/bank excavation, it is anticipated that the remaining piece of land between the river and the canal will be approximately 80 feet wide and is expected to be primarily rock.

- A causeway could be constructed over the land-cut section of the Champlain Canal during the off-season when the canal was drained to mobilize/demobilize equipment and materials to the isthmus area. This approach would alleviate the concern regarding the restricted capacity of bridges over the land-cut section of the Champlain Canal.

- Potential interference with the navigation of project and non-project vessels could be avoided by using controls and coordinating the barge transport and transloading operations with the New York State Canal Corporation (NYSCC).

- A separate property could be used to mobilize equipment (i.e., dredges, tugs, monitoring vessels) to the river and to transfer backfill/cap material into the Landlocked Area.

Based on this evaluation, the selected dredged material transport approach for the Landlocked Area is Alternative A (mechanical transloading of dredged material from the Landlocked Area to barges in the land-cut portion of the canal along with river access and backfill/cap material loading at a separate property).

The land available to facilitate dredged material transfer operations from the Landlocked Area is limited to areas that are immediately adjacent to the river. GE conducted a detailed evaluation of potential sites that could be used to transport dredged material out of the Landlocked Area as well as to transfer backfill/cap materials into the Landlocked Area and mobilize equipment/materials/personnel. This evaluation was conducted using criteria similar to those used by EPA when it evaluated potential sites for the Sediment Processing Facility. This process involved several steps: (1) identification of evaluation criteria; (2) identification and mapping of potential groups of properties; (3) initial screening of the property groups to screen out properties that are unsuitable from an engineering perspective for use as support facilities; (4) secondary screening of properties that were carried forward after the initial screening; and (5) identification of properties proposed for use to support the Landlocked Area dredging project.

This evaluation process and the results of the evaluation are also described in Attachment G (Section 3). As discussed there, properties located on islands in the river, those located along the central and southern portions of the eastern shoreline of the Landlocked Area, and those located in the northern portion of the western shoreline were all screened out as unsuitable for various reasons (e.g., lack of road or river access, presence of existing residential communities, bridge capacity restrictions, topographic limitations, etc.). Properties located in the northern portion of the Landlocked Area along the eastern shoreline and properties located in the southern end of the Landlocked Area along the western shoreline were identified as being most suitable to support the Landlocked Area dredging project, because they have direct river access, suitable shoreline frontage, sufficient space, and suitable topography. In addition, property owners along the southwestern shoreline of the area have indicated their willingness to allow their properties to be used for this project.

Based on this evaluation, a portion of the narrow isthmus property on the eastern shoreline in the northern portion of the Landlocked Area was selected as the location

for construction of a dredged material transload station (herein referred to as the Isthmus Transload Area [ITA]), and three contiguous properties along the western shoreline in the southern portion of the Landlocked Area were selected as the location for construction of a river access/barge loading area (herein referred to as the Landlocked Barge Loading Area [LBLA]). The proposed locations for the ITA and LBLA are shown on Figures 1-2, 1-3, 2-1, and 2-2.

Additional details related to the approach for dredging in the Landlocked Area are provided below.

2.2 Landlocked Area Implementation Approach

Dredging in the Landlocked Area will be conducted using mechanical dredging equipment equipped with environmental clamshell buckets. The dredged sediment and debris will be transported by barge to the ITA. At the ITA, the dredged sediments will be transloaded over a narrow strip of land (the isthmus) located east of the Landlocked Area of the river to load hopper barges in the land-cut section of the Champlain Canal. After the hopper barges in the land-cut canal section are loaded, the barges will be transported to the Sediment Processing Facility. At the Sediment Processing Facility, the dredged material will be dewatered and loaded into railcars for transport and disposal with sediment dredged from other areas of the river. Backfill/cap material will be transported by truck to the LBLA and then loaded onto barges for placement after dredging is completed in each CU. After the dredging and backfilling/capping operations are completed, the ITA and the LBLA will be dismantled, decontaminated, and restored to return the areas to pre-work conditions, to the extent practicable.

The dredging, dredged material transport, and backfilling/capping operations in the Landlocked Area will be conducted by a contractor retained under Contract 43B (the Landlocked Area Contractor). The construction of the ITA, the transloading of sediment from barges in the Landlocked Area to barges in the land-cut section of the Champlain Canal, and the transport of the dredged material from the ITA to the Sediment Processing Facility will be conducted under Contract 42A by the same contractor performing the 2014 dredging and dredged material transport operations in other areas of the river (the Mainstem Dredging Contractor).

Once the dredged sediments have been delivered to the Sediment Processing Facility, the dredged sediment and debris will be unloaded, dewatered, and loaded into railcars by the Processing Facility Operations Contractor under the existing contract with that contractor (Contract 30).

Additional information regarding the design and approach for the Landlocked Area dredging project is presented in the following sections of this report.

2.3 Landlocked Area Dredging Schedule

Construction of the ITA commenced in March 2014. The site work for that construction has been completed, and the installation of equipment is expected to be completed by mid-June 2014. Construction of the LBLA is expected to commence in June 2014 following EPA approval of the LBLA construction plan. Dredging in the Landlocked Area will commence after construction of the ITA and LBLA is completed and after EPA approval of this Reach 7 FDR as well as the Reach 7 RAWP. The dredging operations in the Landlocked Area will be conducted concurrently with dredging operations in other downstream areas of the river. It is anticipated that dredging in the Landlocked Area will be completed in 2014. The anticipated schedule for implementation of the Landlocked Area dredging project is discussed in the Reach 7 RAWP. The actual timing and duration for dredging operations in the Landlocked Area will depend on numerous factors including, but not limited to, the following:

- The timing of EPA approval of this Reach 7 FDR;
- The timing of EPA approval of the 2014 RAWP and the Reach 7 RAWP;
- The timing of completion of construction of the ITA and the LBLA;
- 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;
- The productivity of dredging operations in the Landlocked Area, including areas with shallow water and limited access;
- The extent of operational adjustments (slowdowns, shutdowns, adjustments to dredging sequencing) necessary to comply with the Performance Standards;
- The frequency of high river flows or other factors, such as fog, that limit safe and productive dredging;
- The ability to efficiently transload dredged material, debris, and water at the ITA; and
- The rate of backfilling and capping operations and CU closure.

3. Design Supporting Information – Reach 7

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 in Reach 7. Much of the supporting information described in previous design reports – notably, the Final 2 Final Design Report for 2012 (2012 FDR; ARCADIS 2012) and the Phase 2 Final Design Report for 2013 (2013 FDR; ARCADIS 2013) – applies to the design for the Reach 7 dredging operations and is not repeated in this report. Instead, this Reach 7 FDR focuses mainly on elements that are specific to Reach 7 or that differ from the design information presented in those prior reports.

3.1 Phase 2 Performance Requirements

Performance requirements guide the design for Reach 7 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 Quality of Life Performance Standards (QoLPS).

3.1.1 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, as well as EPA's July 2004 decision in a dispute resolution proceeding on GE's initial Phase 1 Dredge Area Delineation (DAD) Report, are summarized in the 2012 FDR and are not repeated in this report.

3.1.2 Engineering Performance Standards

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 2010a). The Phase 2 EPS, as they apply to the Phase 2 Design, are summarized in the 2012 FDR and are not repeated in this report.

3.1.3 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 QoLPS, issued by EPA in May 2004 (EPA 2004a), 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 2014 PSCP.

3.1.4 Phase 2 Water Quality Requirements

The Phase 2 WQ Requirements (including turbidity requirements) for work in 2014 are described in the 2014 PSCP. Those requirements are applicable to Reach 7.

3.1.5 Monitoring and Reporting

The monitoring programs that GE will conduct during the Reach 7 dredging operations to meet the requirements of the Phase 2 EPS, Phase 2 QoLPS, and Phase 2 WQ Requirements are described in the Phase 2 Remedial Action Monitoring Quality Assurance Project Plan (Phase 2 RAM QAPP; Anchor QEA 2012), with any approved revisions. 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 will be the same as those identified in the 2014 PSCP.

3.2 Summary of Phase 2 Design Support Activities

This subsection summarizes activities that support the remedial design for Reach 7. Design supporting information described in the 2012 FDR or 2013 FDR is not repeated in this design report.

3.2.1 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 Reach 7.

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 Dredge Area Delineation (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 testing), 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 (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 2012). The data generated from the 2011 sediment sampling program 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 4.2.4 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 Reach 7.

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.

3.2.2 Bathymetry Surveys

In 2011, GE conducted surveys to gather additional bathymetry and shoreline elevation data in Reach 7 to support the development of the design, update volume calculations, and verify the location of the delineated shoreline (see Section 4.2.2). The 2011 survey activities were conducted by Thew Associates.

The available bathymetry data were used to estimate the sediment surface elevation. The data for various surveys were 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 CU61 through CU66, the sediment surface elevations have primarily been set using 2011 multi-beam bathymetric data. 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 Ocean Surveys, Inc. (OSI) based on 2003 single-beam data.

The updated bathymetry surfaces for Reach 7 are provided on the CD-ROM included with this report.

3.2.3 Habitat Delineation and Habitat Assessment

Habitat was delineated and assessed 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 (UCB), 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, the RFW boundaries in Reach 7 were checked in the field on October 15, 2013 in coordination with EPA. Based on those observations, the RFW boundaries are consistent with the previously delineated boundaries, with the exception of CU66 where a small (approximately 0.02-acre) wetland area was identified at the mouth of the small tributary along the western shoreline. In addition, as part of the October 15, 2013 field observations, approximately 0.74 acre of SAV was identified in CU64/CU65 east of Galusha Island in an area that had not been previously delineated. Based on those observations, the extents of SAV in and near CU64/CU65 were adjusted. The updated boundaries for the RFW and SAV in these CUs have been incorporated into the design and are shown on the figures included in Attachment C and on the Drawings in Appendix 2.

At EPA's request, GE and EPA will conduct an additional field visit in the 2014 growing season to review the delineated RFW boundaries in the northernmost portion of CU65.

An electronic data file of the most recent habitat delineation is provided on the enclosed CD-ROM.

3.2.4 Landlocked Barge Loading Area – Wetland Delineation

Wetlands adjacent to the LBLA were delineated in the field in December 2012 and in April 2013 by Anchor QEA. Based on this field delineation, wetland areas were identified in low-lying, wooded areas at the properties where the LBLA will be constructed. On April 21, 2014, GE and EPA representatives performed additional field observations to review the field-delineated wetland area boundaries adjacent to the LBLA. Based on those observations, the boundary for one of the field-delineated wetland areas was adjusted, staked in the field, and surveyed. In addition, the 100-foot area adjacent to the wetland in the northwestern portion of the LBLA was adjusted at EPA's request. The updated field-delineated wetland area boundaries and associated 100-foot adjacent areas have been incorporated into the design. A summary of the wetland delineation is presented in Attachment H. Figure 2-2 shows the locations of the

field-delineated wetland area and the 100-foot adjacent area surrounding the field-delineated wetlands.

Measures that will be implemented to protect the delineated wetlands and the 100-foot adjacent areas and to restore disturbed wetland areas are described in Section 4.1.2.2.

3.2.5 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. 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.

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 Reach 7. 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 through the summer of 2013. No active eagle nests were observed in the vicinity of areas currently targeted for dredging in the Landlocked Area (CU61 through CU66). Similar observations along those portions of the river to be dredged in Reach 7, at the ITA, and at the LBLA will be coordinated with EPA and conducted in the spring of 2014.

The conservation measures listed for bald eagles in the Final BA will be followed to minimize disturbances to eagles. These have been incorporated into Specification Section 01140 (Work Restrictions; Appendix 1). In addition, GE will review with EPA the trees proposed for removal or trimming. Specifically, prior to tree trimming or removal, GE will conduct a field review to ensure that no potential eagle perching or roosting trees are proposed for removal; and plans identifying the trees proposed for removal will be provided to EPA for review and approval prior to tree trimming/removal to verify that potential perching or roosting trees will not be removed.

3.2.6 Phase 2 Cultural and Archaeological Resources Assessment Program

Archaeological resource assessments were conducted to document terrestrial and underwater archaeological resources that could be affected during the Reach 7 dredging operations. These were summarized in the following documents:

- Archaeological Resources Assessment Report for Phase 2 Dredge Areas (Phase 2 ARA Report; URS 2008);
- Underwater Remote Sensing Report for Certification Units 31 Through 70 in Phase 2 Remediation of the Hudson River PCBs Superfund Site (URS 2011);
- 2012 Terrestrial Archaeological Survey and Evaluation for the Land-Locked and Fort Miller Dam Sections of the Phase 2 Dredge Areas (URS 2013b); and
- 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 2013c).

Based on these archaeological resource assessments, no sensitive archaeological resources were identified at in-river or shoreline areas within or in the immediate vicinity of CU61 through CU66 in Reach 7. Nevertheless, archaeological protection measures will be implemented during the dredging operations as described in Section 4.3.9.

Archaeological resource assessments were also conducted to document terrestrial archaeological resources that could be affected by construction and operations at the LBLA. These archaeological resource assessments are summarized in the following documents:

- Phase I and II Archaeological Investigations at the Site of Fort Miller (A091-14-0009) (URS 2012);
- Additional Phase I and II Archaeological investigations at Property Containing the Site of Fort Miller (A091-14-0009) (URS 2013a);
- Terrestrial Archaeological Resources Survey of a Potential Work Support Facility Site South of Fort Miller Site (URS 2013d);

- End of Fieldwork Management Summary: Additional Phase II Archaeological Investigations at the Site of Fort Miller (A091-14-0009) (URS 2013e); and

- Comprehensive Report on All Phase I and Phase II Archaeological Investigations at Property Containing the Site of Fort Miller (A091.14.0009) (URS 2014a).

Based on the findings of archaeological assessment activities, mid-eighteenth century artifacts with documented, intact, fort-related features were identified only in the certain upland areas in the northeastern portion of the property where the LBLA will be located. This property has been divided into three zones based on these findings:

- *Archaeological Upland Zone A* – is the portion of the property that has been found to be devoid of cultural materials and features. Archaeological Upland Zone A is located in the southern and western portions of the field adjacent to the river and includes that portion of the property extending to West River Road.

- *Archaeological Upland Zone B* – is an area in the northeastern portion of the property with mid-eighteenth century artifacts but without identified cultural features.

- *Archaeological Upland Zone C* – is an area in the northeastern portion of the property with mid-eighteenth century artifacts and documented, intact, fort-related features.

The locations of Archaeological Upland Zones A, B, and C at the LBLA are shown on Figure 2-2 and Drawing D-2606 (Appendix 2). The potential effects of facility construction and operations at the LBLA on these resources were evaluated during the remedial design, and measures established to protect these resources are described in Section 4.1.2.1.

A cultural resource assessment was also completed for the ITA and documented in a report titled Cultural Resource Assessment, Isthmus Transload Area, Washington County, New York (URS 2014b). During reviews of previous projects involving impacts to the Barge Canal, the New York State Office of Parks, Recreation, and Historic Preservation previously recommended that the entire Barge Canal system be considered an historic property that is eligible for inclusion in the National Register of Historic Places (NRHP). For the ITA project, there will be no permanent changes to significant canal features. Two areas of potential temporary impact were identified. These included the construction and removal of the temporary causeway for equipment access, and the excavation of about 350 feet of the western bank of the

canal to facilitate barge mooring. Measures that will be implemented to address such potential impacts and restore the affected areas are described in Section 4.1.1.2.

4. Design Summary – Reach 7

This Reach 7 FDR includes design information, drawings, and specifications for dredging and dredged material transport operations associated with CU61 through CU66 in the Landlocked Area. The Contract 43B specifications are provided in Appendix 1, and the drawings for dredging (D-series), backfill (B-series), isolation cap (C-series), and existing conditions (G-series) are provided in Appendix 2.

This design report also includes the conceptual design for habitat construction planting areas in CU61 through CU66. The final habitat construction design for the Reach 7 CUs will depend on the conditions after dredging operations are completed in these CUs, and the final habitat construction design drawings and specifications associated with these CUs will be provided to EPA in a separate design submittal.

The following subsections and Tables 4-1 and 4-2 summarize elements of the design associated with Reach 7, focusing on items that are specific to the targeted dredging areas or that differ from the design approach presented in the 2013 FDR.

4.1 Site Preparation

As outlined in Section 2 above, the Landlocked Area dredging project requires development of properties adjacent to the river to mobilize/demobilize equipment to and from the river, to transport dredged material out of the Landlocked Area of the river, and to move backfill/cap material onto the river for placement in the dredged areas. As discussed above, the specific properties to be used for these activities are referred to as the ITA and the LBLA. Information related to the development of these project support areas is presented below.

4.1.1 Isthmus Transload Area

The ITA will be a temporary site used to transload dredged sediment, debris, and water from the Landlocked Area to hopper barges staged in the land-cut portion of the Champlain Canal. The ITA is being constructed and will be operated under Contract 42A by the same contractor performing the 2014 dredging and dredged material transport operations in other areas of the river (the Mainstem Dredging Contractor). The temporary ITA is located on a narrow strip of land between the Landlocked Area of the river and the land-cut section of the Champlain Canal in the northern portion of Reach 7. The location of the ITA is shown on Figures 1-2, 1-3, and 2-1.

4.1.1.1 Construction and Operation of the ITA

Details related to the construction of the ITA were provided to EPA in the Phase 2 Construction Plan for Reach 7 Isthmus Transload Area (Appendix A to the Reach 7 RAWP). Construction of the ITA commenced in March 2014 and has included the following:

- A temporary causeway was constructed across the land-cut section of the Champlain Canal to facilitate access for construction equipment/materials and to mobilize the transloading equipment. The temporary causeway was constructed while the land-cut area was drained during the canal off-season and was removed before the Champlain Canal was flooded for the 2014 navigation season.

- Tree trimming and grubbing to clear areas were performed as needed for the construction and operation of the ITA.

- The bank on the canal side of the transloading station was excavated to widen the canal for mooring of the large hopper barges to be loaded from the transloading station. The excavated area provides sufficient depth for fully loaded barges.

- Access dredging/bank excavation will be conducted on the river side of the transloading station to provide sufficient water depth to stage barges for unloading. It is anticipated that some rock, anticipated to be weathered shale, will be encountered and that it will be able to be removed by ripping or by breaking up with a hoe ram. No blasting of rock is planned during the construction of the ITA.

- The site was graded to provide a level work area for the ITA.

- An impermeable liner system was constructed to protect underlying soils and groundwater and to contain stormwater that collects in the material handling area.

It is anticipated that the ITA will be approximately 80 feet wide between the river and the land-cut section of the canal. Based on the configuration of the ITA, it is estimated that hopper barges staged in the land-cut section will encroach on the navigation channel by approximately 4 feet. The following measures will be implemented to

minimize disturbance to non-project vessels using the navigation channel during the temporary operation of the ITA:

- Barges staged at the ITA will be lit during low-visibility conditions.
- Signage will be placed in the canal both north and south of the ITA mooring location to notify boaters of the modified channel width and the barge activity.
- Local Notices to Mariners (NTMs) provided to the NYSCC will present necessary details about the transloading operations and the staging of barges along the land-cut section of the canal.
- Passage of large non-project vessels, requiring full width of the channel, will be coordinated with the NYSCC so that no barges will be moored at the ITA during the period when those vessels pass through the land-cut channel.

Measures have been implemented during construction of the ITA and will be implemented during the operation of the ITA to protect soils, groundwater, and nearby surface water from contamination and to mitigate disturbance to the environment and potential cultural resources. These protective measures include the following:

- Erosion and sedimentation control measures will be implemented in accordance with an erosion and sedimentation control plan prepared by the contractor.
- A Spill Prevention, Control, and Countermeasure (SPCC) Plan will be prepared and will be followed during the project activities.
- A qualified spill response subcontractor will be on call to respond to any spills.
- Field observations were coordinated with EPA prior to construction activities to verify that no active bald eagle nests were present in the vicinity of the ITA. In addition, removal of trees in the area has been minimized to the extent practicable. Tree removals were approved by EPA.
- Construction of the ITA was monitored and photographed to provide a record of the existing conditions of the canal and to document baseline conditions to ensure accurate restoration of the site.

- A wetland assessment was conducted for the ITA to determine if any wetland areas were present that could be affected by construction and/or operations at the ITA. The findings of the wetland assessment were reviewed with EPA to determine if measures are needed to protect wetlands and/or if details need to be developed to restore any disturbed wetland areas.

- Dredged material handling and transloading operations at the ITA will be conducted within a restricted exclusion zone. Material handling will be conducted within an impermeable containment pad to prevent contamination of the underlying soils, groundwater, and nearby surface water. The containment pad has been constructed using a flexible membrane liner system, a concrete pad, and concrete curbing. In addition, the sediment transloading area will use spill shields on both sides of the transloading area to prevent spilling, splattering, or misplacement of dredged materials.

- The containment pad has been designed and constructed to protect the ITA from flooding up to and including a FEMA 100-year river flood elevation of 125.4 ft NAVD88.

- The containment pad is sloped to drain toward a water collection sump. Water that accumulates on the containment pad at the ITA (i.e., water released from the dredged sediment and stormwater that falls on the pad) will be collected in a sump and pumped to either temporary water storage tanks or directly to a hopper barge staged in the land-cut section of the canal.

- A decontamination station will be provided to decontaminate equipment and personnel that have entered into the exclusion zone.

Additional details related to the operation of the ITA are provided in Section 3 of the Reach 7 RAWP.

4.1.1.2 Measures for Protection of Historic Properties

As discussed in Section 3.2.6, a cultural resource assessment for the ITA (URS 2014b) identified two areas of potential temporary impact on the Barge Canal system, which is considered eligible for the NRHP – namely, the construction and removal of the temporary causeway for equipment access, and the excavation of about 350 feet of the western bank of the canal to facilitate barge mooring. As provided in the above-referenced cultural resource assessment for the ITA, the material removed from the

bank was stockpiled, and the bank will be restored to its pre-project condition following completion of the dredging in the Landlocked Area. In addition to restoring the canal channel to its existing bathymetry following completion of transloading operations, the following measures will be implemented. Each of the above construction steps was monitored and photographed to provide a record of the existing conditions of the canal and to document baseline conditions to ensure accurate restoration of the site. This documentation included oversight by an archaeologist during the excavation of the western wall of the canal to monitor and document the existing conditions. These activities included reviewing existing bathymetry and land survey data, recording measurements of distances and angle of the prism of the canal, and documentation of the profile and material conditions, including the type and size of rip rap used as bank armor. A report summarizing the conditions documented during construction of the ITA and describing the restoration of the area will be submitted to EPA following restoration of the ITA.

4.1.2 Landlocked Barge Loading Area

The LBLA will be a temporary site used to provide river access/egress for equipment, materials, and personnel to the Landlocked Area of the river. The LBLA will also be used as the location where backfill/cap materials will be temporarily staged and then loaded onto barges in the Landlocked Area of the river. The LBLA is located on property to the west of the Landlocked Area in the southern portion of Reach 7. The location of the LBLA is shown on Figures 1-2, 1-3, and 2-2.

The LBLA will be constructed and operated under Contract 43B. The Contract 43B specifications in Appendix 1 present requirements related to the construction and operation of the LBLA. Details related to the operation of the LBLA are included in the Reach 7 RAWP.

Specific considerations that have been incorporated into the design to protect sensitive archaeological areas and wetlands during the construction and operation of the LBLA are described below.

4.1.2.1 Archaeological Site Protection Measures

As described in Section 3.2.6, archaeological resource assessments conducted by URS at the location of the LBLA have identified archaeological artifacts of the colonial-era Fort Miller. The property where the LBLA is located has been divided into three zones based on these findings – Archaeological Upland Zone A, Archaeological

Upland Zone B, and Archaeological Upland Zone C. The locations of these zones are shown on Figure 2-2 and Drawing D-2606 (Appendix 2).

Archaeological site protection measures will be implemented as described in Specification Section 01353 (Cultural Resources, Appendix 1), as supplemented by measures developed by the Landlocked Area Contractor thereunder. Archaeological site protection measures will be implemented in Archaeological Upland Zones B and C; no specific archaeological site protection measures will be required in Archaeological Upland Zone A. The protective measures to be implemented by the Landlocked Area Contractor in Archaeological Upland Zones B and C are specified in a Protection Plan for the Site of Fort Miller (URS 2014c), approved by EPA on June 18, 2014, and are summarized below:

- The contractor notified the Construction Manager at least 2 weeks before initiating work in or adjacent to Archaeological Upland Zones B and C.

- An archaeologist was present during the start of LBLA construction and will be during demobilization to monitor construction activities.

- Archaeological Upland Zone C will not be used for any project activities. Prior to construction operations at the LBLA, the contractor will clearly mark the perimeter of Archaeological Upland Zone C with survey stakes and flags (or other markers approved by the Construction Manager and EPA). Orange safety fencing will be installed to restrict entry and access to Archaeological Upland Zone C as well as the unused portions of Archaeological Upland Zone B.

- The contractor will mark the limits of Archaeological Upland Zone B with survey stakes and flags (or other markers approved by the Construction Manager and EPA) prior to initiation of work in this area. In addition, the perimeter of the portions of Archaeological Upland Zone B that will not be used for project activities (and also encompassing Archaeological Upland Zone C) will be marked with continuous orange safety fencing (or other fencing approved by the Construction Manager and EPA) and signage to restrict entry and access. Only the western portion of Archaeological Upland Zone B will be used for project activities.

- No excavation, soil grading, vegetation removal, or other ground-intrusive activities will be conducted in Archaeological Upland Zone B.

- No tree removal will be performed in Archaeological Upland Zone B unless approved in writing by the Construction Manager. Any tree removal in Archaeological Upland Zone B will be performed using handsaws, chainsaws, and slings. Tree branches and trunks will be cut to the extent necessary to implement the work. Tree trunks/root balls will not be removed.

- Sheet piling and/or foundations that extend below the existing ground surface will not be installed in Archaeological Upland Zone B.

- Prior to using any portions of Archaeological Upland Zone B, the contractor will install a cover over the portions of that zone to be used in the project. This cover will include the placement of a non-woven geotextile layer (to be placed by hand) over those portions to mark the top of the existing soils, followed by placement of a layer of gravel or wood chips 6 to 12 inches in thickness on top of that geotextile layer. Gravel will be used in vehicle areas to distribute wheel loads so as to further minimize disturbance to existing soils in Archaeological Upland Zone B. The overlying gravel or wood chips will be deposited working inward from the Archaeological Upland Zone A/B interface, using light machinery to the extent practicable, so as to further reduce impacts to Archaeological Upland Zone B.

- Vibratory compaction will not be performed on existing soils or materials placed in Archaeological Upland Zone B.

- Archaeological Upland Zone B will be restored after the dredging and backfilling/capping operations are completed.

- In the event that unanticipated archaeological artifacts or features or human remains are encountered during the work, the procedures set forth in the above-referenced Fort Miller Protection Plan will be followed.

4.1.2.2 Wetland Protection Measures and Restoration Measures

As summarized in Section 3.2.4 and described in Attachment H, wetland areas were field delineated in low-lying, wooded areas at the properties adjacent to where the LBLA will be constructed. Figure 2-2 shows the locations of the field-delineated wetland areas along with 100-foot adjacent areas surrounding the field-delineated wetlands.

No expected loss or impairment of wetland functions are expected as part of the LBLA construction and operations. LBLA construction and operations will not be performed in the field-delineated wetland areas unless approved by the Construction Manager and EPA. To the extent practicable, the Landlocked Area Contractor will also minimize disturbance within the 100-foot adjacent areas surrounding the delineated wetland areas. Orange snow fencing will be installed at the perimeter of the field-delineated wetland areas in the vicinity of the LBLA to restrict entry and access into the wetland areas.

Disturbed portions of field-delineated wetlands (if any) or the 100-foot adjacent areas surrounding the delineated wetlands will be restored by reestablishing pre-work topography and drainage patterns; placing topsoil and/or other necessary materials to stabilize the disturbed areas and provide an appropriate substrate for seeding/planting; and replanting and seeding the disturbed vegetation with similar species. Requirements for the protection and restoration of wetland areas and the 100-foot adjacent areas surrounding the delineated wetland areas are described in Specification Sections 13756 (Landlocked Barge Loading Area) and 13760 (Site Restoration) in Appendix 1.

4.2 Dredge Area Limits

A summary of the CUs designed for dredging in Reach 7 is provided below.

4.2.1 Dredge Area Delineation

The dredging design process begins with the delineation of dredge areas, including the identification of both the horizontal and vertical extents of dredging. The Phase 2 DAD Report (QEA 2007) identified the dredge areas and quantified the volume and PCB mass targeted for removal in the Reach 7 dredge areas. The initial limits of the Phase 2 CUs were presented in the Phase 2 IDR (ARCADIS 2008).

4.2.2 Shoreline Definition

In July 2012 and March 2013, GE and EPA met to review and discuss the approach for establishing the shoreline elevations and locations in River Sections 2 and 3. The shoreline elevations and locations were established for Reach 7 based on those discussions and as summarized below.

Consistent with the designs for other reaches of the river, the shoreline elevations for Reach 7 have been established based on water surface elevations associated with a river flow of approximately 5,000 cubic feet per second (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 to the Phase 2 IDR) was used to estimate the water surface elevations in Reach 7 corresponding to this flow.

As described in Section 3.2.2, GE performed surveys in 2011 to gather additional bathymetry and topographic data in Reach 7 to support the development of the design, update volume calculations, and verify the location of the delineated shoreline. The water surface elevations predicted by the hydrodynamic model were reviewed and compared with the 2011 survey data and the existing shoreline boundary.

The water surface elevations predicted by the hydrodynamic model for Reach 7 correlated reasonably well with the survey data collected in 2011 and the shoreline boundary digitized from aerial photography. The design shoreline elevation established for Reach 7 (CU61 through CU66) is 114.9 feet (ft) (North American Vertical Datum of 1988 [NAVD88]). Surveys of the water surface elevation at various river flows support the selection of this elevation to represent the shoreline for Reach 7.

As with the other reaches of the river, the shoreline boundaries in Reach 7 were initially digitized from aerial photography. The survey data collected in 2011 were used to adjust the existing shoreline location, where appropriate, to approximate the above-referenced shoreline elevation. This revised shoreline has been incorporated into the basis of the design as the horizontal limit of dredging and backfilling for CU61 through CU66.

An electronic data file of the shoreline coordinates for Reach 7 is provided on the CD-ROM included with this report.

4.2.3 Certification Unit Revisions

As part of the final design, the CU boundaries presented in the Phase 2 IDR were adjusted for the Reach 7 CUs. The boundaries of CU61 through CU66 were adjusted based on the results of data gap sampling performed during 2008 as summarized in the Phase 2 Data Gap Data Summary Report (Anchor QEA and ESI 2009) and/or based on the results of the 2012 SEDC sampling as presented in the 2011 SEDC Data Summary Report (Anchor QEA and ESI 2012). Figures showing where the footprints of

these CUs have been impacted by these sampling programs are provided in Attachment A.

Additionally, the internal boundaries of CU63 through CU66 were adjusted as part of the final design. These adjustments were made based on operational considerations (i.e., to improve continuity of the CUs), and did not change the overall acreage of the dredge areas.

An electronic data file of the CU boundaries for CU61 through CU66 is provided on the CD-ROM included with this report.

4.2.4 Design Dredge Prism Development

The Phase 2 CDE requires that GE develop an EoC surface to define the elevation that captures the PCB inventory and meets the removal criteria within the targeted areas. As summarized in the 2013 FDR, the EoC surface is 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 Glacial Lake Albany Clay [GLAC] or bedrock) also influence its development.

The EoC surface was developed for CU61 through CU66 by the same process detailed in Section 2.4 of the Phase 2 CDE and summarized in Section 3.1.4 of the 2013 FDR. As described in Attachment A, an initial EoC surface was developed for CU61 through CU66 to meet the requirements of the Phase 2 CDE. The EoC surface was then adjusted for engineering considerations to create the final dredge prisms (described in Attachment B). The dredge prisms for CU61 through CU66 were developed using multi-beam bathymetry surveys conducted in 2011, where available.

Table 4-3 summarizes the areas, design cut volumes, and estimated PCB mass for CU61 through CU66 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 (i.e., existing bathymetry elevations, polygon file showing the EoC method in each area of the river) are provided on a CD-ROM with this report.

4.2.5 Design Dredging Volume

As summarized in Table 4-3, the estimated volume of sediment defined for removal by the Design Dredge Prism XYZ file is 117,500 cy for CU61 through CU66. It is anticipated that re-dredging, where required, may generate as much as 30,000 cy of additional sediment for removal. The actual volume of sediment that will be dredged in Reach 7 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;
- The amount of over-dredging performed to achieve the required elevations within the specified tolerances;
- The extent and elevations of GLAC and dredge 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 contractor (i.e., dredging of slopes outside the shoreline edge of the CU boundaries steeper than those shown in the dredge prism); and
- 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.

4.3 Dredging and Dredged Material Transport

A summary of the design for the dredging and dredged material transport for the Landlocked Area is presented in the following subsections.

4.3.1 Shoreline Vegetation Pruning

Prior to dredging, shoreline vegetation that overhangs the dredge areas will be pruned. GE will review with EPA the trees proposed for removal or trimming. The dredging contractor will prepare a tree removal plan identifying trees that are proposed for removal in order to dredge sediment or place backfill/cap material along the shoreline. Prior to tree trimming or removal, GE will conduct a field review to ensure that no potential eagle perching or roosting trees are proposed for removal. Plans identifying the trees proposed for removal will be provided to EPA for review and approval prior to tree trimming/removal to verify that potential perching or roosting trees will not be removed. 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. Shoreline vegetation will be pruned in accordance with Specification Section 13893 (Removal of Shoreline Vegetation; Appendix 1).

4.3.2 Debris Removal

Debris will be removed prior to or as part of dredging. In the event that debris cannot be removed with the dredge bucket, the Landlocked Area Contractor will be prepared to use alternate procedures and/or equipment to remove debris as necessary to facilitate dredging to the required elevations. Debris will be removed in accordance with Specification Section 13804 (Landlocked Area Sediment Removal; Appendix 1).

4.3.3 Dredging

Dredging activities will commence after the ITA and LBLA have been completed and are ready for use and EPA has approved this Reach 7 FDR and the Reach 7 RAWP. 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 production goals.

Dredging in the Landlocked Area will be conducted using one or more mechanical excavator-mounted, hydraulically closing environmental clamshell bucket dredges. Specification Section 13804 (Landlocked Area Sediment Removal; Appendix 1) presents the requirements for the dredging operations. The number and size of dredges and the type and size of dredge buckets to be used in the Landlocked Area will be identified by the Landlocked Area Contractor and presented in the Reach 7 RAWP.

Dredging is expected to begin in the northern end of the Landlocked Area (CU61 and CU62) and generally proceed downstream. However, access dredging may be required in additional areas earlier in the dredging season to facilitate dredged material transport to the ITA. The dredging operations in the Landlocked Area will be conducted concurrently with dredging operations in other reaches of the river, consistent with the Phase 2 EPS, which allows simultaneous dredging in areas separated by a dam or areas separated by more than 1,000 feet to maintain dredging productivity and efficiency. The proposed dredging sequence and schedule will be described in the Reach 7 RAWP based on input from the contractor.

The areas subject to dredging will be delineated *in situ* into areas that are expected to yield dewatered material with PCB concentrations less than 50 parts per million (ppm) and those are expected to yield dewatered material with PCB concentrations at or above 50 ppm. This delineation will use the approach described in the 2014 TDP (Parsons 2014b; Appendix C to the 2014 RAWP) following approval of that approach by EPA (with any modifications on which EPA and GE agree). The purpose of this delineation is to facilitate the separate handling of such materials for purposes of ultimate transport and disposal, as discussed further in Section 4.4 below and in more detail in the 2014 TDP. (Until EPA approves the 2014 TDP, GE will follow the Phase 2 Transportation and Disposal Plan for 2013, which was Appendix C to the 2013 RAWP [Parsons 2013a].)

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.

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-2860 (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 contractor. Such setbacks may be necessary where the contractor believes that dredging operations cannot be implemented safely or where the 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. These proposed setbacks will be submitted to EPA for approval prior to being incorporated into the dredge prisms. As described in Specification

Section 13804 (Landlocked Area Sediment Removal; Appendix 1), Construction Dredge Prism XYZ Files will be provided to the contractor and will serve as the basis for determining whether dredging has achieved the required elevations. The dredging tolerance requirements are presented in Specification Section 13804 (Landlocked Area Sediment Removal; Appendix 1).

4.3.4 Dredged Material Transport

As described in Section 2, dredged sediment and debris will be transported by barge from the dredging areas to the west side of the ITA. At the ITA, the dredged sediment, debris, and water will be unloaded from the barges in the Landlocked Area and moved over a narrow strip of land (the isthmus) to load hopper barges in the "land-cut" section of the Champlain Canal. One long-reach excavator will be used to offload sediment from smaller barges in the Landlocked Area of the river onto the impermeable containment pad. A second long-reach excavator will then transload the sediment from the containment pad into the larger hopper barges moored in the land-cut section of the canal. Water that accumulates on the containment pad at the ITA (i.e., water released from the dredged sediment and stormwater that falls on the pad) will be conveyed to a collection sump and pumped either to temporary water storage tanks or directly to a hopper barge staged in the land-cut section of the canal. After the hopper barges in the land-cut section are loaded, the barges will be transported under Contract 42A to the Sediment Processing Facility for sediment unloading and dewatering with sediment dredged from other portions of the river.

If on-river transloading operations are necessary (i.e., to transfer dredged material or debris from one barge to another barge), GE will provide EPA with a figure showing the proposed locations for the on-river transloading. The need and locations for on-river transloading will be determined in the field by the contractor based on available water depths and equipment.

Requirements for dredged material transport are described in Specification Sections 13804 (Landlocked Area Sediment Removal) and 13811 (In-River Material Transport) in Appendix 1.

The dredged material river transport equipment will be described in the Reach 7 RAWP based on contractor input.

4.3.5 Access to Dredging Areas

Dredging of non-target material may be necessary to provide access to shallow-water dredge areas. The need for and actual extent of access dredging will be determined by the Landlocked Area Contractor and the Construction Manager and will depend on the dredging approach, schedule, sequence, and field conditions encountered. Any access dredging proposed by the 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. Areas proposed for access dredging will be reviewed to verify that those areas do not contain potential archaeological resources. Plans for proposed access dredging for Reach 7 will be provided to EPA with a revised version of the Reach 7 RAWP or separately on a case-by-case basis as field conditions dictate and will be reviewed with EPA prior to dredging those areas. In addition, any required backfilling and habitat construction resulting from access dredging areas will be reviewed with EPA prior to dredging those areas.

4.3.6 Anchoring Restrictions

Anchoring will be restricted in areas outside of the CUs where SAV or RFW habitat is present, in areas where SAV has been planted, in backfilled areas designated as SAV planting, contingency, and natural recolonization areas, in backfilled areas designated for RFW construction, and in areas where isolation caps have been placed. However, due to the shape and size of the various CU subunits, it will be necessary to spud dredge and backfill platforms outside of the limits of the CU subunits. Some of these areas are designated as SAV areas. Each of these areas will be reviewed with EPA prior to spudding in the area. The extent of area around the CU to be approved for spud placement will be addressed in the Reach 7 RAWP. The specification requirements for anchoring during dredging operations are documented in Specification Section 13820 (Anchoring; Appendix 1). The anchoring restrictions in Reach 7 are shown on Drawings D-4601 through D-4606 (Appendix 2). An electronic data file with the restricted anchoring areas for Reach 7 is provided on the CD-ROM included with this report.

Areas proposed for anchoring will be reviewed to verify that those areas do not contain potential archaeological resources. The proposed anchoring areas will be reviewed with EPA prior to using those areas for anchoring.

4.3.7 Air Mitigation and Sheen Response BMPs

In accordance with the Phase 2 CDE, routine air mitigation best management practices (BMPs) are required to be implemented in areas with the potential to emit PCBs to the air at levels close to or exceeding the applicable air quality standard (air mitigation BMP areas). Specification Section 02938 (Air Emissions Restrictions and Controls; Appendix 1) includes requirements for routine air emissions controls and lists the potential air mitigation BMPs to be implemented as directed by the Construction Manager. The routine air emission BMPs and other control measures will be the same as those described in Section 6 of the 2014 PSCP, with any modifications specified in the Reach 7 RAWP based on contractor input. Additional mitigation measures must be implemented, as necessary, in dredge areas where measured PCB concentrations at a nearby receptor results in exceedance of the applicable air quality standard on 3 consecutive days. The additional mitigation measures to be considered in these circumstances will be the same as those described in the 2014 PSCP.

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 milligrams per kilogram (mg/kg). Specification Section 13871 (Sheen Response During Dredging Operations; Appendix 1) describes the contractor's requirements to address sheens and NAPL, including requirements for notification and reporting, implementation of BMPs, and sheen response actions if sheens are observed. If booms or other sheen response materials become loose or are otherwise released, those materials will be retrieved to the extent practicable. GE will notify EPA if such materials cannot be retrieved.

The approach for designating air mitigation BMP areas and sheen response BMP areas in CU61 through CU66 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 associated with the design cut are also shown on Drawings D-3611 through D-3616 (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.

4.3.8 Resuspension Control

In accordance with the Phase 2 CDE, resuspension control BMPs are required 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 net loads of PCBs with three or more chlorine atoms (Tri+ PCBs) (measured as daily percent release) under the Resuspension Standard is exceeded. Such measures are discussed in the 2014 PSCP.

4.3.8.1 Analysis of Resuspension

Dredging and management of resuspension for the Landlocked Area will continue in a manner similar to the approach used in 2011, 2012, and 2013. GE, the Construction Manager, and the 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. Average total PCB concentrations associated with the design cut are included in Attachment D of this Reach 7 FDR and will be reviewed continually in the field to guide management of operations with respect to resuspension. These average PCB concentrations 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. An electronic data file with the average mass-weighted PCB concentrations associated with the Thiessen polygons developed for CU61 through CU66 is provided on the CD-ROM included with this report.

Near-field and far-field data will be collected to provide a basis for whether the operational controls are effective. The locations of the near-field and far-field monitoring stations to be used for the Landlocked Area will be identified in the 2014 RAWP. Because dredging operations in the Landlocked Area will be conducted concurrently with dredging operations in other areas of the river, the near-field and far-field data will be reviewed to determine the source of any exceedance of the Resuspension Performance Standard. If exceedances occur, an analysis will be performed to try to determine what area and/or specific conditions may have led to the exceedance; and, if necessary, operations will be adjusted to prevent future

exceedances. If resuspension exceedances continue, 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.

4.3.8.2 Resuspension Control BMPs

The 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 routine and contingent resuspension control BMPs are included in Specification Section 13805 (Resuspension Control; Appendix 1) and will apply to CU61 through CU66. The need for and type of contingent BMPs will be determined in the field based on monitoring data obtained during operations.

4.3.8.3 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 PCBs 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 Reach 7 dredging.

4.3.9 Archaeological Site Protection Measures

Although no sensitive archaeological resources were identified at in-river or shoreline areas within or in the immediate vicinity of CU61 through CU66 (see Section 3.2.6); certain archaeological protection measures will be implemented in accordance with Specification Section 01353 (Cultural Resources; Appendix 1). Specifically, if, during

the dredging operations, potentially significant cultural resources are identified in areas where resources were not previously identified, activities in the immediate area that may damage or alter such resources will be halted and EPA will be notified. In addition, the contractor will be required to notify the Construction Manager if debris encountered during debris removal or dredging extends into the riverbank in any dredge area. The contractor will be instructed not to remove debris that extends into the riverbank unless otherwise directed by the Construction Manager, in consultation with EPA.

4.4 Sediment Processing, Segregation, and Disposal

Upon arrival at the Sediment Processing Facility, sediment and debris removed from CU61 through CU66 will be unloaded and dewatered with sediment dredged from other areas of the river. Dredged sediments and debris will be characterized and managed for transport and disposal in accordance with the 2014 TDP (Appendix C to the 2014 RAWP) following approval by EPA (with any modifications on which EPA and GE agree). Specifically, these activities will be conducted in accordance with the procedures specified in that TDP for characterizing, segregating, and handling materials to be disposed of at a facility authorized under the Toxic Substances Control Act (TSCA) and coarse materials that are expected to be suitable for disposal at a Resource Conservation and Recovery Act (RCRA) Subtitle D solid waste landfill, and for testing the latter after dewatering to confirm that they do not constitute TSCA-regulated materials and thus may be sent to a RCRA Subtitle D landfill. The resulting materials will then be loaded into railcars and separately transported by rail to the respective disposal facilities authorized to receive and dispose of such materials (i.e., a TSCA-authorized facility or a RCRA Subtitle D facility) as described in the 2014 TDP.

4.5 Backfilling/Capping

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.

4.5.1 Backfill/Cap Footprint

Dredged areas will be covered by backfill or cap material, based on residual sample results. The decision to place backfill or isolation caps will be based on the post-dredging distribution of PCB concentrations in accordance with the Phase 2 EPS and the 2014 PSCP or as otherwise approved by EPA. The Phase 2 EPS limit the amount

of capping that will be allowed in Phase 2. The capping limits, based on the Phase 2 EPS, are described in the 2014 PSCP. Since CU61 through CU66 are located entirely outside of the navigation channel, backfill and cap placement restrictions associated with the navigation channel are not applicable to Reach 7. Areas not dredged due to offsets from riprap and structures will not be covered with backfill or cap material. GE will review proposed shoreline/structural offsets with EPA after a field survey by the contractor.

4.5.2 Backfill

Consistent with the design for other areas of the river, 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.

4.5.2.1 Backfill Material Types

The backfill material specifications for CU61 through CU66 in Reach 7 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.

- 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, habitat layer backfill, and RFW construction areas.

- The upper 1 foot of RFW construction areas will consist of a mixture of Type 2 backfill and topsoil with a total organic carbon (TOC) content between 2 and 5 percent, referred to as Type 5 backfill material.

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 incorporated into the design in low-velocity areas having a slope steeper than five horizontal to one vertical (5H:1V) and near-shore areas adjacent to high-velocity areas or adjacent to slopes steeper than 5H:1V.

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 additional areas will be reviewed with EPA prior to backfill placement.

4.5.2.2 Base Backfill Layer

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 as described in Sections 4.5.2.3, 4.5.2.4, and 4.5.2.5, and except where isolation caps will be placed.

The locations where the base backfill layer will be placed are shown on figures included in Attachment I and are identified on Drawings B-2621 through B-2626 (Appendix 2).

4.5.2.3 Near-shore Backfill

EPA's November 2006 Final Decision regarding issues disputed by GE (EPA 2006), which is referenced in the Phase 2 CDE, specified that for dredge areas near the shoreline, the surface water elevation associated with a flow corresponding to the minimum one day average flow that occurs once every three years (1Q3; flow of 1,100 cfs at the Ft Edward gage) is to be used as the basis for the in-river boundary of the near-shore areas that must be restored to pre-dredge bathymetry.

In October 2013, Van Dusen & Steves Land Surveyors surveyed the elevation of the crest of the Fort Miller Dam, which is located at the downstream end of Reach 7. This survey indicated that the elevation of the crest of Fort Miller Dam is 114.46 ft (NAVD88). Because the water surface elevation of the river in the Reach 7 pool will not drop below the dam crest elevation, GE proposed to establish the near-shore elevation in Reach 7 at an elevation of 114.5 ft (NAVD88), consistent with the crest elevation of the dam. In October 2013, EPA agreed that the near-shore boundary elevation of 114.5 ft (NAVD88) is acceptable for Reach 7. This elevation has been incorporated into the basis of the design as the near-shore boundary elevation for CU61 through CU66 in Reach 7.

The near-shore area is defined as the area between the shoreline and the near-shore boundary elevation. Near-shore setpoints were established in near-shore backfill areas at intervals of approximately 100 feet, and at points of inflection, along the near-shore boundary contour line based on the 2011 bathymetry survey data in CU61 through CU66. 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. 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.

As indicated on Figure E-7 in Attachment E, the portion of CU64 immediately north of Galusha Island will be designated for placement of near-shore backfill. The backfill placement tolerances described in Specification Section 13721 (Backfilling/Capping; Appendix 1) includes specific requirements related to the placement of near-shore backfill in this portion of CU64.

Near-shore backfill will be placed to pre-dredging bathymetry in the near-shore area. 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 backfill layer or cap layer.

Details and example cross-sections for near-shore backfill are shown on Drawing B-2606 (Appendix 2). The near-shore border and near-shore setpoints, along with locations where near-shore backfill materials will be applied, are identified on figures included in Attachment I and on Drawings B-2621 through B-2626 (Appendix 2). The coordinates for the near-shore setpoints are identified on Drawing B-2860 (Appendix 2).

4.5.2.4 Habitat Layer Backfill

In accordance with the Phase 2 CDE, additional backfill (hereafter referred to as “habitat layer backfill”) will be used to reconstruct conceptual SAV primary and contingency planting areas and natural recolonization areas (referred to collectively as “SAV Areas” in the remainder of this section) 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 106.9 ft [NAVD88] in Reach 7 after dredging and placement of the backfill layer or isolation caps is completed).

Habitat layer backfill will be placed to return the area either 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 in SAV Areas with pre-dredging elevations between 106.9 ft and 109.9 ft to return the areas to pre-dredging bathymetry, and in SAV Areas with pre-dredging elevation between 109.9 ft and 112.9 ft to return the areas to an elevation of 109.9 ft.

SAV Areas have been developed for CU61 through CU66 as described in Section 4.7.3 and Attachment C. These areas are shown on Drawings B-2621 through B-2626 (Appendix 2) and on figures included in Attachment I. These areas will be used in determining the locations and extent of habitat layer backfill placement, depending on the post-dredging elevations. Potential locations where habitat layer backfill may be applicable are also shown on the figures included in Attachment I. Habitat layer backfill will not be placed in areas designated for placement of near-shore backfill (to be backfilled to pre-dredging bathymetry – see Section 4.5.2.3).

After dredging is completed and prior to backfill placement, the Construction Manager will provide the contractor with the locations, extents, and elevations for placement of the habitat layer backfill. The locations and elevations for placement of habitat layer backfill will be based on the post-dredging elevations in the SAV Areas. The determination of whether to place habitat layer backfill will also be based on the locations of isolation caps and adjustments (if any) to the conceptual habitat construction locations based on post-dredging conditions. The habitat layer backfill designs developed after the completion of dredging 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-2608 (Appendix 2). The habitat layer backfill will consist of Type 1 or Type 2 material. At the contractor's option, Type 2 material may be used as a base material below the upper 1 foot of Type 1 material in habitat layer backfill areas where the Type 1 material is specified. 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.

The areas receiving habitat layer backfill and the total volume placed in CU61 through CU66 will be determined during the CU certification process.

4.5.2.5 Riverine Fringing Wetland Construction Areas

Approximately 1.7 acres of RFW have been delineated in CU61 through CU66. The RFW construction areas in CU61 through CU66 are identified in Attachment C. 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 2011) and adjusted based on the field review conducted during October 2013 with EPA as described in Section 3.2.3, except for an approximately 0.11-acre portion of the wetland area located in CU65 at the downstream end of Galusha Island. As described in Attachment C, this wetland area in CU65 has been relocated to an area in CU64 along the eastern shoreline of Galusha Island to create a larger, more continuous wetland area.

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. 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. 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 RFW construction areas will be seeded in accordance with existing Specification Section 13701 (Riverine Fringing Wetland Seeding; Appendix 1). Forecasted weather conditions and projected river flows will be considered when scheduling RFW seeding to minimize the potential for washing out of seeds. GE will provide to EPA a RFW seeding plan (including Zone B) following receipt from the contractor. This information will be provided as part of a revised Reach 7 RAWP or as part of routine project coordination meetings.

Wetland boundary material will not be placed in RFW construction areas in Reach 7, because this area is less exposed to boat wakes due to its location outside of the navigation channel.

Details and example cross-sections for the typical RFW construction areas are identified on Drawing B-2607 (Appendix 2). The RFW construction area locations are identified on figures included in Attachment I and on Drawings B-2621 through B-2626 (Appendix 2).

The backfill placement and tolerance requirements for RFW construction areas restored to pre-dredge bathymetry are described in Specification Section 13721 (Landlocked Area Backfilling/Capping; Appendix 1).

4.5.3 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. The criteria requiring or allowing for installation of an engineered cap based on post-dredging residuals concentrations are described in the 2014 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 previous Phase 2 FDRs was 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 Attachment F of the approved Phase 2 Final Design Report for 2011 (2011 FDR; ARCADIS 2011).

The two isolation cap prototypes – medium-velocity isolation cap Type C and high-velocity isolation cap Type C – designed during development of the 2011 FDR will be applied in Reach 7.

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-8 in Attachment F show the modeled velocity distributions for CU61 to CU66 under 100-year flow conditions. These figures

will serve as a basis for determining armor types for the dredge areas if a cap is required.

Because CU61 through CU66 are located outside the limits of the navigation channel, the design does not include requirements associated with placement of isolation caps in the navigation channel in Reach 7.

Details and example cross-sections for the prototype isolation caps are provided on Drawing C-2605 (Appendix 2). The potential locations for placement of the medium- and high-velocity isolation caps are identified on Drawings C-2611 through C-2616 (Appendix 2).

Long-term monitoring and maintenance requirements for the isolation caps to be installed in Reach 7 will be described in an Operation, Maintenance, and Monitoring Plan for Caps and Habitat Replacement/Reconstruction (Cap/Habitat OM&M Plan) for the year in which the caps are placed. These requirements will be based on those described in the previously approved Operation, Maintenance, and Monitoring Plans for Phase 2 Year 1 Caps and Habitat Replacement/Reconstruction (Parsons 2012) and for 2012 Caps and Habitat Replacement/Reconstruction (Parsons 2013b).

4.5.4 Backfill and Cap Material Placement

The backfill and cap material placement and tolerance requirements for Reach 7 are described in Specification Section 13721 (Landlocked Area Backfill/Capping; Appendix 1). Backfill/cap material will be transported by truck to the LBLA for staging prior to placement in the CUs after dredging. It is anticipated that backfill and cap materials will be loaded onto barges at the LBLA and placed in the CUs 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 contractor and described in the Reach 7 RAWP.

4.5.5 Backfill and Cap Material Sources

Potential sources of backfill and cap materials and the routes of delivery to the LBLA are described in the Reach 7 RAWP.

4.5.6 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.

4.5.6.1 Shoreline Stabilization

Shoreline stabilization (or shoreline treatments) will be applied in areas where dredging is performed up to the designated shoreline elevation, and will include implementation of stabilization measures below the shoreline elevation. The types of shoreline treatments include near-shore backfill, RFW construction, and Type P armor stone.

On July 10, 2012, a field inspection was conducted by GE to identify the shoreline treatments to be applied in CU61 through CU66. 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; and
- Minimization of hardening of the shoreline, to the extent practicable.

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-3621 through B-3626 (Appendix 2). Details for the shoreline stabilization treatments are identified on Drawing B-2609 (Appendix 2).

Long-term monitoring and maintenance requirements for stabilized shoreline areas will be described in the Cap/Habitat OM&M Plan for the year in which the dredging and backfill/capping operations are completed in Reach 7.

4.5.6.2 Shoreline Repair

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

If areas above the designated shoreline elevation are disturbed, they will be reconstructed 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-2610 (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; Appendix 1).

4.6 Demobilization and Restoration

After dredging and backfilling/capping operations are completed, the ITA and LBLA will be dismantled and restored to return the area to pre-work conditions, to the extent practicable. These activities will include, but will not be limited to, demobilizing construction materials and equipment, importing fill material/topsoil, grading to restore pre-work topography and drainage patterns, placing topsoil and/or other necessary materials to stabilize the disturbed areas and provide an appropriate substrate for seeding/planting of the disturbed areas. Restoration of disturbed shoreline areas at the ITA and LBLA will include a vegetated (non-armored) bank and tree plantings. Field-delineated wetland areas in the vicinity of the LBLA and 100-foot adjacent areas surrounding the delineated wetland areas that are disturbed will be restored in accordance with Specification Section 13760 (Site Restoration; Appendix 1).

Further details regarding the decommissioning and restoration of the ITA and the LBLA, including restoration and planting plans, will be provided in the Reach 7 Demobilization and Restoration Plan for Landlocked Area (Appendix C to the Reach 7 RAWP) for EPA review and approval. These plans will include drawings showing grading for the disturbed areas, drawings showing the proposed planting and seeding areas, and specifications for the types of seed mixtures and plants to be used for

planting. The drawings provided with the LBLA restoration plan will also show the field-delineated wetland areas in the vicinity of the LBLA and the 100-foot adjacent area surrounding the delineated wetlands.

4.7 Habitat Construction – Reach 7

Habitat construction areas in Reach 7 are 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 Reach 7 design. Estimated locations and 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 CU61 through CU66 is presented in Attachment C. The habitat construction planting areas and estimated habitat layer backfill areas presented in Attachment C are preliminary. The final habitat construction design for the Reach 7 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. The habitat construction for SAV and RFW in these areas will be performed in subsequent years.

4.7.1 Unconsolidated River Bottom Habitat

UCB habitat will be reconstructed through the placement of Type 1 or Type 2 backfill. The locations where Types 1 and 2 backfill will be applied are shown on Drawings B-2621 through B-2626 (Appendix 2).

4.7.2 Riverine Fringing Wetlands

RFWs affected by the remediation will be replaced at their current locations, to the extent practicable, as delineated in the Wetland Delineation Report for Phase 2 Areas (Anchor QEA 2011) and adjusted based on the field review conducted with EPA as described in Section 3.2.3. As described in Attachment C, an approximately 0.11-acre portion of the wetland area located in CU65 has been relocated to the eastern shoreline of Galusha Island in CU64.

Construction of replacement RFWs will involve backfilling the RFW areas as described in Section 4.5.2.5. 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.

4.7.3 Submerged Aquatic Vegetation Beds

SAV beds will be reconstructed or replaced 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 conceptual SAV primary and contingency planting areas, and natural recolonization areas for CU61 through CU66 are shown on figures in Attachment C. SAV contingency areas may be planted if any of the designated SAV primary 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 CU61 through CU66 are shown on Drawings B-2621 through B-2626 (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. In addition, an electronic data file of the habitat matrix output described in Attachment C is provided on the enclosed CD-ROM.

4.8 Quality of Life Standards

A summary of how the QoLPS parameters have been considered in the design for Reach 7 is provided below.

4.8.1 Air Quality – PCBs

As discussed in Section 4.3.7, 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-3611 through D-3616 (Appendix 2). Specification Section 02938 (Air Emissions Restrictions and Controls; Appendix 1) includes requirements for air emission controls and lists the routine air mitigation BMPs that may be implemented during the dredging and dredged material transport operations. The routine air emission BMPs and other control measures to be

implemented as directed by the Construction Manager will be the same as those described in Section 6 of the 2014 PSCP.

In addition to the routine BMPs, additional mitigation measures will be implemented in dredge areas or in the vicinity of the ITA when measured PCB concentrations at a nearby receptor show an exceedance of an applicable PCB air quality standard on 3 consecutive days. The additional mitigation measures to be considered in these circumstances will be as described in the 2014 PSCP.

4.8.2 Air Quality – National Ambient Air Quality Standards

An air quality modeling analysis conducted during the Phase 1 design demonstrated that the emissions of criteria pollutants from in-river activities and Sediment 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 whether any operational or equipment changes are anticipated in Phase 2 that could affect these pollutants. If no such change is anticipated, no further evaluation of the criteria pollutants and no monitoring for such pollutants are necessary during Phase 2.

In accordance with the Phase 2 PSCP Scope and Phase 2 CHASP Scope, NAAQS analyses were previously conducted and presented as attachments to the 2011 FDR and 2012 FDR to evaluate whether anticipated operational or equipment changes that could affect emissions of criteria pollutants required revision of the Phase 1 NAAQS analysis. These previous analyses confirmed that the Phase 1 analysis did not need to be revised to reflect such changes. Specifically, the 2012 evaluation (presented in Attachment F to the 2012 FDR) demonstrated that the predicted hourly and annual emissions of the criteria pollutants for the 2012 season were below the Phase 1 design emissions estimates, and it thus concluded that no additional NAAQS modeling or evaluation was required for 2012. In 2013, GE again reviewed potential operational and equipment changes, including the addition of push tugs for the transport of barges over longer distances; and it concluded that 2013 operations would not involve design changes that would be expected to significantly affect emissions of criteria pollutants, and that thus a revised analysis was not necessary.

Dredging operations associated with Reach 7 are expected to be similar to those implemented during 2012 and 2013, with no operational or equipment changes that are expected to significantly affect emissions of criteria pollutants. Thus, given the EPA-approved evaluations for those prior years, a revised NAAQS evaluation is not

considered necessary and has not been completed for the Reach 7 dredging operations. Similarly, no provisions for monitoring, control, or contingency measures for criteria pollutants will be necessary for CU61 through CU66.

In any event, preventative or contingency measures are included in the specifications to prevent the generation of particulates in the form of dust during Landlocked Area operations. These measures include the following:

- Dust control measures will be implemented by the contractor to prevent and control on-site dust generation and migration during operations.

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

- The contractor will be required to prevent and mitigate spills of material on haul roads.

4.8.3 Odor

It is not anticipated that sediments dredged in Reach 7 will generate odors that will reach the concern or exceedance levels established 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 to be taken to address exceedance of the criteria in the Phase 2 QoLPS and associated reporting requirements are discussed in the 2014 PSCP.

4.8.4 Noise

During Landlocked Area operations (as in the prior Phase 2 seasons), noise will be monitored by the 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 will also be monitored at the ITA, LBLA, or elsewhere within the Landlocked Area 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 contractor 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, as discussed in the 2014 PSCP.

4.8.5 Lighting

During Landlocked Area operations, light will be monitored by the 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 will also be monitored at the ITA, LBLA, or elsewhere within the Landlocked Area 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 contractor 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 exceedance, as discussed in the 2014 PSCP.

4.8.6 Navigation

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 and at the same time allowing efficient performance of the project.

The Champlain Canal bypasses Reach 7 via the land-cut area north of Lock 6. As a result, the dredging and backfilling/capping operations in the Landlocked Area will not hinder overall non-project-related vessel movement in the navigable portion of the river. However, it is possible that residents living along the Landlocked Area may use that area for boating and recreational purposes. Accordingly, navigation monitoring and other navigation-related measures (as described in the 2014 PSCP) will be conducted within the Landlocked Area as necessary to comply with the requirements of the navigation standard that apply to areas outside the navigation channel.

The ITA will be located adjacent to the land-cut section of the Champlain Canal. Based on the proposed alignment of the ITA, hopper barges moored in the land-cut area at the ITA will encroach on the navigation channel by approximately 4 feet. Measures will be implemented during ITA operations to maximize safety and productivity and to avoid unnecessary disruption of non-project-related navigation in the channel, while allowing efficient performance of those operations. NTMs provided to the NYSCC will present necessary details about the transloading operations and the staging of barges along the land-cut section of the canal. At the ITA, the barges will be lit during low-visibility conditions and signage will be placed in the canal both north and south of the ITA mooring location to notify boaters of the modified channel width and the barge activity. Passage of large non-project vessels, requiring full width of the channel, will be coordinated with the NYSCC so that no barges will be moored at the ITA during the period when those vessels pass through the land-cut channel.

5. Remedial Action Implementation

This section summarizes the contracts under which the Landlocked Area dredging 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 the Landlocked Area and a reference to the schedule for implementation of the remedial action activities. The contract associated with the habitat construction for the Landlocked Area dredge areas is not discussed in this report.

5.1 Remedial Action Contracts – Reach 7

The remedial action for Reach 7 has been organized into the following contracts based on the nature of work to be accomplished under each:

- *Contract 43B – Landlocked Area Dredging Operations:* Dredging operations, dredged material transport operations from the dredge areas to the ITA, construction/operation/demobilization/restoration of the LBLA, and backfilling/ capping operations will be conducted under Contract 43B by the Landlocked Area Contractor. Specifications for Contract 43B are provided in Appendix 1 of this report, including specifications for general conditions and requirements (Division 1 specifications) and the technical specifications (Divisions 2 through 13 specifications). Drawings for Contract 43B are provided in Appendix 2.

- *Contract 42A – Dredged Material Transloading and Transport:* Construction, operation, demobilization, and restoration of the ITA, as well as dredged material transloading at the ITA and dredged material transport from the ITA to the Sediment Processing Facility, will be conducted under Contract 42A by the Mainstem Dredging Contractor. The specifications for Contract 42A have been presented in other design reports (e.g., the CU85-CU96 FDR) and are not presented with this design report. Any changes to the technical specifications for Contract 42A will be provided to EPA for review under separate cover.

- *Contract 30 – Processing Facility Operations:* The operations at the Sediment Processing Facility will continue to be conducted under Contract 30, which is the same contract issued for work implemented during 2011, 2012, and 2013 and covers seasonal startup, commissioning, sediment processing, and railcar loading operations at the Sediment Processing Facility. The specifications for Contract 30 (issued with the approved 2011 FDR and as revised in 2012 and 2013) 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 60 – Rail Yard Operations:* The rail yard operations will continue to be conducted under Contract 60, which is the same contract issued for the work implemented during 2011, 2012, and 2013. The specifications for Contract 60 (issued with the approved 2011 FDR and revised in 2012 and 2013) 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.

5.2 Remedial Action Work Plan and Other Remedial Action Submittals

Section 3.1 of the revised SOW (EPA 2010b) requires GE to submit a RAWP for Phase 2 dredging and facility operations to be performed in each construction year of Phase 2. GE has submitted a Reach 7 RAWP (Parsons 2014c) separately from this Reach 7 FDR and separately from the 2014 RAWP. The Reach 7 RAWP describes the dredging operations to be performed for Reach 7 and includes a dredging production schedule. The Reach 7 RAWP includes certain appendices, listed in Section 1 above, and incorporates, as appropriate, the procedures and requirements in the appendices to the 2014 RAWP.

GE has already submitted the 2014 Remedial Action Health and Safety Plan (RA HASP) to address potential worker health and safety issues for GE and its contractors' workers, describe potential hazards and impacts to project workers, and identify 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. Any additions or revisions to the Phase 2 RAM QAPP related to the Landlocked Area dredging project will be submitted to EPA for review under separate cover as Corrective Action Memoranda.

5.3 Remedial Action Implementation Schedule – Reach 7

The schedule for implementation of Landlocked Area dredging operations is discussed in Section 2.3 above and set forth in the Reach 7 RAWP.

6. References

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7. Acronyms and Abbreviations

1Q3	Minimum 1-day average flow that occurs once every 3 years
ARA	Archaeological Resources Assessment
ARARs	Applicable or Relevant and Appropriate Requirements
ARCADIS	ARCADIS of New York, Inc.
AOC	Administrative Order on Consent
BA	Biological Assessment
BBL	Blasland, Bouck & Lee, Inc.
BMP	Best Management Practice
CD	Consent Decree
CDE	Critical Design Elements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CHASP	Community Health and Safety Plan or Community Health and Safety Program
CQAP	Construction Quality Assurance/Quality Control Plan
CU	Certification Unit
cy	cubic yards
DAD	Dredge Area Delineation
DoC	Depth of Contamination

DOT	U.S. Department of Transportation
E&E	Ecology & Environment
EoC	Elevation of Contamination
EPA	U.S. Environmental Protection Agency
EPS	Engineering Performance Standards
ESI	Environmental Standards, Inc.
FDR	Final Design Report
ft	feet
ft/s	feet per second
g/m^2	grams per square meter
GE	General Electric Company
GLAC	Glacial Lake Albany Clay
HA	Habitat Assessment
HASP	Health and Safety Plan
HD	Habitat Delineation
HDA	Habitat Delineation and Assessment
IDR	Intermediate Design Report
ITA	Isthmus Transload Area
LBLA	Landlocked Barge Loading Area
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
NTM	Notice to Mariners
NYSCC	New York State Canal Corporation
OMM	Operations, Maintenance, and Monitoring
OSI	Ocean Surveys, Inc.
PAP	Property Access Plan
PCB	polychlorinated biphenyl
PDR	Preliminary Design Report
ppm	parts per million
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
SPCC	Spill Prevention, Control, and Countermeasure
SSAP	Sediment Sampling and Analysis Program
TDP	Transportation and Disposal Plan
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
WQ	Water Quality

ARCADIS

Tables

Table 4-1
Basis of Design for Dredging and Dredged Material Transport – Reach 7

Phase 2 Final Design Report for Reach 7 (the Landlocked Area)
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
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 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 2004b)
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 Reach 7 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)
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
Reach 7 CUs	CU61 through CU66	
Design cut volume for each CU	See Table 4-3	· 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
Re-dredge volume	To be determined	· Subject to post-dredging residual sampling data and the Residual Performance Standard in the Phase 2 EPS
Dredging 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 dredge refusal or clay areas, as accepted by the Construction Manager, will be considered to have been achieved (EPA 2012)
Dredging season (both the design cut and re-dredge passes)	Approximately 28 weeks	· Assumed length of the navigational season (i.e., early May to mid-November) · Actual length of navigational season is controlled by the NYSCC. The actual canal opening and closing dates may differ and could be affected by conditions such as weather and/or high river flows
Dredging and in-river dredged material transport 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	· The type, number, and size of dredges will be identified in the Reach 7 RAWP based on contractor input
In-river dredged material transport type	Barge transport	· Dredged materials will be transloaded from the landlocked section of the river to the land-cut section of the Champlain Canal · The type, number, and size of barges and tugs will be identified in the Reach 7 RAWP based on contractor input

Table 4-1
Basis of Design for Dredging and Dredged Material Transport – Reach 7

Phase 2 Final Design Report for Reach 7 (the Landlocked Area)
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Shoreline definition	Reach 7: 114.9 ft elevation NAVD88	· See Section 4.2.2
Near-shore area	Reach 7: Area between the 114.9 ft shoreline and the 114.5 ft in-river pre-dredge elevation	· See Section 4.5.2.3
Existing conditions – river bottom contours	Multi-beam bathymetry surveys (by Thew) and single-beam bathymetric surveys (by OSI) where multi-beam data have not been collected	· Bathymetric surveys conducted by OSI in 2003 for Reach 7 · Bathymetric surveys conducted by Thew Associates in 2011 for Reach 7
Water depths	Depth varies	· Varies based on river flow · Pre-dredging water depths based on bathymetric surveys conducted in 2003 and 2011 · Post-dredge water depths (before backfill/cap material placement) based on the Design Dredge Prism XYZ File
Sediment chemistry	<u>Key Parameter:</u> · PCBs	· SSAP and SEDC database (see Section 3.2.1)
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 Conditions 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 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 3.2.3
Presence of archaeological resources	Data summarized in archaeological assessment reports	· See Section 3.2.6

Table 4-1
Basis of Design for Dredging and Dredged Material Transport – Reach 7

Phase 2 Final Design Report for Reach 7 (the Landlocked Area)
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Anchoring restrictions	See D-series Drawings	· Without approval from EPA, anchoring will be restricted within: (i) areas where wetlands and SAV have been delineated outside of dredge areas; (ii) areas where backfill has been placed and accepted by the Construction Manager in conceptual SAV planting areas, conceptual SAV contingency planting areas, conceptual natural recolonization areas, and delineated wetland areas: (iii) areas where SAV and RFW have been planted: (iv) designated natural recolonization areas; and (v) areas where caps have been placed. · 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 Sections 3.1.3 and 4.8	· 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 2010b) · The 2014 PSCP prepared as part of the 2014 RAWP describes specific actions to be taken to address exceedances of the criteria in the QoLPS
Air emission BMPs	See Sections 4.3.7	· Phase 2 CDE · Required Adaptive Responses and Design Improvements for Phase 2, Year 2 (EPA 2012) · The 2014 PSCP prepared as part of the 2014 RAWP describes specific actions to be taken to address exceedances of the PCB air quality standard
Resuspension BMPs	See Section 4.3.8	· Phase 2 CDE
Sheen response BMPs	See Section 4.3.7	· Phase 2 CDE

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

Table 4-2
Basis of Design for Backfilling/Capping – Reach 7

Phase 2 Final Design Report for Reach 7 (the Landlocked Area)
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
Backfill/cap footprint	Approximately 29 acres would be considered for backfill and/or cap placement within CU61 through CU66	· See Section 4.5.1 · The Phase 2 EPS limits the amount of capping that will be allowed in Phase 2 (EPA 2010a)
Top elevations of caps within the navigation channel	Not applicable	· CU61 through CU66 are located outside of the navigation channel
The top elevation of backfill within the navigation channel	Not applicable	· CU61 through CU66 are located outside of the navigation channel
Backfill thickness	Varies	· The backfill layer will be 12 inches (1 foot; ROD; EPA 2002) · Near-shore backfill will be restored to pre-dredging bathymetry between the shoreline and the near-shore border (as defined below) per 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 109.9 ft (NAVD88) in Reach 7 (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 (pre-dredging) bathymetry
Near-shore area	<u>Reach 7 (CU61 – CU66):</u> Area between the shoreline and the 114.5 ft in-river pre-dredge elevation	· See Section 4.5.2.3 · The near-shore area is the portion of the CUs between the shoreline and the near-shore border · Near-shore backfill will be restored to original (pre-dredging) bathymetry in the near-shore area (Phase 2 CDE) · In Reach 7, pre-dredging bed elevation equals 114.5 ft (NAVD88) at near-shore setpoints, which are located along the pre-dredging bathymetric 114.5 ft elevation contour line based on previous bathymetric surveys · The near-shore border line extends between the near-shore setpoints
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 4.5.2.1 · Flow velocities based on the Phase 2 Hydrodynamic Model (Attachment D of the Phase 2 IDR)
Backfill Material Types	Type 1, Type 2, Type 5	· 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 4.5.2.1 · 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 and as adjusted as described in Section 4.5.2.1 · 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 near-shore backfill, habitat layer backfill, and 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
Water depth after dredging	Varies	· Function of location in the river and dredging depths (range based on bathymetric data)

Table 4-2
Basis of Design for Backfilling/Capping – Reach 7

Phase 2 Final Design Report for Reach 7 (the Landlocked Area)
General Electric Company – Hudson River PCBs Superfund Site

Item	Basis	Source/Notes
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
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
Isolation cap design parameters	See Attachment F of the 2011 FDR	· See Section 4.5.3

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

Table 4-3
Certification Unit Areas and Design Volumes

Phase 2 Final Design Report for Reach 7 (the Landlocked Area)
General Electric Company - Hudson River PCBs Superfund Site

Reach	Certification Unit (CU)	CU Area (acres) [1]	Estimated PCB Mass (kg) [5]		EoC Surface Volume (cy) [2,4]	Design Dredge Prism Volume (cy) [3,4]
			Total PCBs	Tri+ PCBs		
Reach 7	CU61	4.93	2,460	640	22,300	25,900
	CU62	4.10	950	200	14,300	14,900
	CU63	6.27	770	280	19,700	20,800
	CU64	4.53	1,010	210	14,300	14,600
	CU65	4.77	1,450	410	16,800	17,600
	CU66	4.65	760	300	22,200	23,700
TOTAL - CU61-CU66		**29.3**	**7,400**	**2,040**	**109,600**	**117,500**

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 2011 for Reach 7. 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.

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Figures

CITY: SYRACUSE, NY DIV/GROUP: 141/ENVCAD DB: L.POSENAUER PM: C.GUEST LYR:(Opt)ON=*;OFF=*REF*
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XREFS:
XBM-MAJR

RIVER SECTION 1

RIVER SECTION 2

RIVER SECTION 3

CORINTH

FORT EDWARD

LOCK #7

ARGYLE

REACH 8
THOMPSON ISLAND POOL

GRIFFIN ISLAND

WEST GRIFFIN ISLAND AREA
CU50-CU54

THOMPSON ISLAND DAM

FORT MILLER

LAND-LOCKED AREA
CU61-CU66

FORT MILLER DAM

REACH 7
LANDLOCKED AREA

SALEM

LOCK #6

REACH 6
NORTHUMBERLAND POOL

NORTHUMBERLAND DAM

BATTEN KILL

LOCK #5

SCHUYLERVILLE

VICTORY

GREENWICH

SARATOGA SPRINGS

CAMBRIDGE

REACH 5
STILLWATER POOL

BALLSTON SPA

STILLWATER

ROUND LAKE

STILLWATER DAM

LOCK #4

REACH 4
UPPER MECHANICVILLE POOL

UPPER MECHANICVILLE DAM

MECHANICVILLE

LOCK #3

VALLEY FALLS

HOOSICK FALLS

REACH 3
LOWER MECHANICVILLE POOL

LOCK #2

SCHAGHTICOKE

LOWER MECHANICVILLE DAM

REACH 2
WATERFORD POOL

WATERFORD DAM

LOCK #1

WATERFORD

REACH 1
TROY POOL

COHOES

MOHAWK RIVER

FEDERAL DAM & LOCK

GREEN ISLAND

TROY

WATERVLIET

0 15000' 30000'
GRAPHIC SCALE

LEGEND:

- PHASE 1 DREDGE AREA (CU01–CU08, CU17, CU18)
- LANDLOCKED AREA PHASE 2 DREDGE AREA (CU61–CU66)
- REMAINDER OF PHASE 2 DREDGE AREAS (CU09–CU16, CU19–CU60, CU67–CU100)
- INCORPORATED AREAS

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
PHASE 2 FINAL DESIGN REPORT FOR REACH 7

UPPER HUDSON RIVER

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FIGURE
1-1

CITY: SYRACUSE, NY DIV/GROUP: 141/ENVCAD DB: L.POSENAUER LD:(Opt) PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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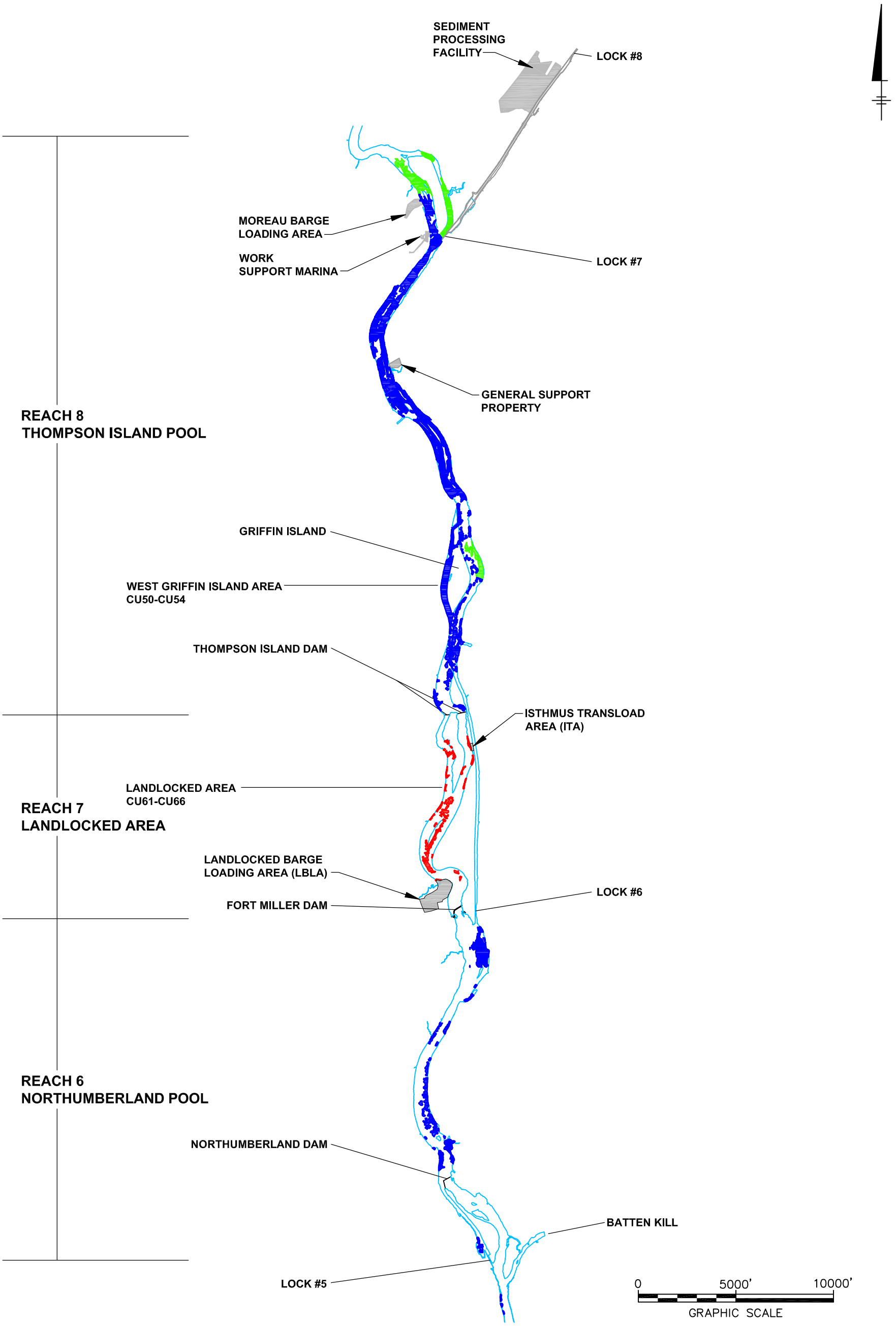

LEGEND:

- PHASE 1 DREDGE AREA
- LANDLOCKED AREA PHASE 2 DREDGE AREA (CU61–CU66)
- REMAINDER OF PHASE 2 DREDGE AREAS (CU09–CU16, CU19–CU60, CU67–CU100)

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PHASE 2 FINAL DESIGN REPORT FOR REACH 7

REACH 7 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*
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XBM-MINR
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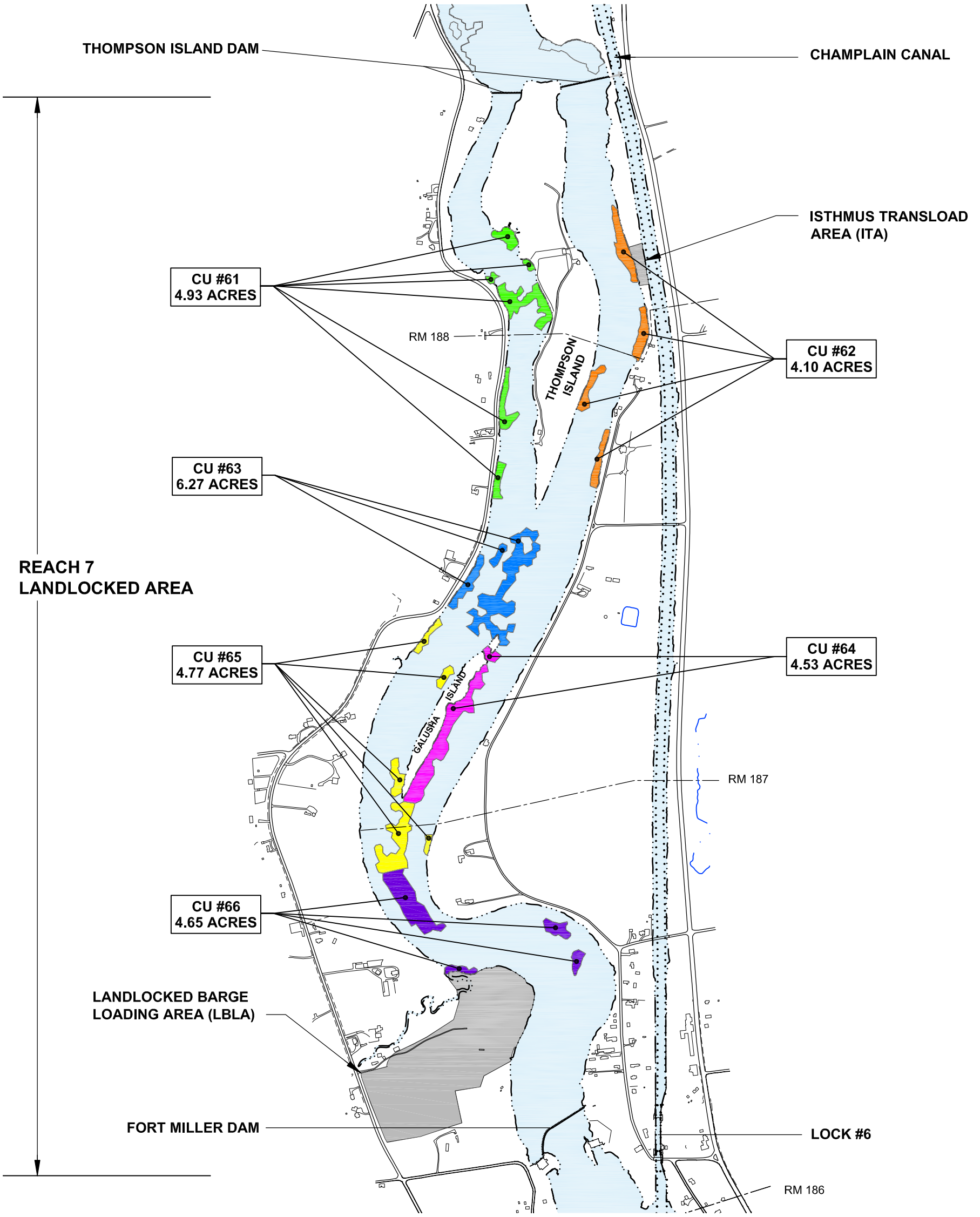
XRV-CU01



LEGEND:

- SHORELINE
- NAVIGATION CHANNEL
- RIVER MILES

0 1000' 2000'
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
PHASE 2 FINAL DESIGN REPORT FOR REACH 7

REACH 7 CERTIFICATION UNITS CU61 THROUGH CU66

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FIGURE
1-3

CITY: SYRACUSE, NY DIV/GROUP: ENVCAD DB: L.POSENAUER LD: L.POSENAUER PIC:(Opt) PM: C.GUEST TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
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RM 188.3

RM 188.2

RM 188.1

RM 188

USHY 4

ISTHMUS TRANSLOAD AREA (ITA)

CU #62
4.10 ACRES

LEGEND:

CERTIFICATION UNIT BOUNDARY

ISTHMUS TRANSLOAD AREA

NOTE:

1. BASE MAP BASED ON AERIAL PHOTOGRAPH TAKEN IN 2012.

0 125' 250'

GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
PHASE 2 FINAL DESIGN REPORT FOR REACH 7

ISTHMUS TRANSLOAD AREA

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FIGURE
2-1

CU #66
4.65 ACRES

CU #66
4.65 ACRES

RM 186.9

RM 186.7

RM 186.6

RM 186.5

RM 186.4

LANDLOCKED BARGE LOADING AREA (LBLA) - AVAILABLE CONTRACTOR WORK AREA

APPROXIMATE EXTENT OF LEASED PROPERTY

FORT MILLER DAM

W. River Rd

County Hwy 46

Champlain Canal

LEGEND:

- CERTIFICATION UNIT BOUNDARY
- AVAILABLE CONTRACTOR WORK AREA
- ARCHAEOLOGICAL UPLAND ZONE A
- ARCHAEOLOGICAL UPLAND ZONE B
- ARCHAEOLOGICAL UPLAND ZONE C
- FIELD-DELINEATED WETLAND AREA
- 100-FOOT WETLAND ADJACENT AREA

NOTES:

1. BASE MAP BASED ON AERIAL PHOTOGRAPH TAKEN IN 2012.
2. THE EXTENTS OF ARCHAEOLOGICAL ZONES A, B, AND C WERE PROVIDED BY URS IN JANUARY 2013. REFER TO THE REACH 7 FDR FOR A DESCRIPTION OF THESE ARCHAEOLOGICAL ZONES.
3. THE FIELD-DELINEATED WETLAND AREA EXTENTS ARE BASED ON WETLAND DELINEATION PERFORMED BY ANCHOR QEA IN DECEMBER 2012 AND APRIL 2013, AND AS ADJUSTED BASED ON FIELD OBSERVATIONS WITH EPA IN APRIL 2014.

0 125' 250'
GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
PHASE 2 FINAL DESIGN REPORT FOR REACH 7

LANDLOCKED BARGE LOADING AREA

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FIGURE
2-2

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