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Habitat Delineation Report

Hudson River PCBs Superfund Site

December 2008

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Habitat Delineation Report

Hudson River PCBs
Superfund Site

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Acronyms and Abbreviations 1

1. Introduction 1-1

1.1 Background 1-1

1.2 Goals of Habitat Delineation 1-1

1.3 Data Quality Objective and Scope of this Report 1-2

1.4 Format of HD Report 1-3

2. Habitat Delineation 2-1

2.1 Overview of Approach 2-1

2.2 Step 1: Review of Existing Information 2-3

2.2.1 Unconsolidated River Bottom 2-3

2.2.2 Aquatic Vegetation Beds 2-4

2.2.3 Shorelines 2-5

2.2.4 Riverine Fringing Wetlands 2-5

2.2.5 Data Gaps 2-6

2.3 Step 2: Aerial Photography and Photo Interpretation, Preliminary Delineation Maps 2-6

2.4 Step 3: Field Verification of Preliminary Habitat Maps 2-10

2.4.1 Unconsolidated River Bottom 2-11

2.4.2 Aquatic Vegetation Beds 2-12

2.4.3 Shorelines 2-14

2.4.4 Riverine Fringing Wetlands 2-14

2.4.5 Mapping Accuracy 2-16

2.5 Step 4: Digitized Habitat Maps 2-18

2.6 Description of Existing Habitats 2-21

2.6.1 Unconsolidated River Bottom 2-21

2.6.2 Aquatic Vegetation Beds 2-22

2.6.3 Shorelines 2-24

2.6.4 Riverine Fringing Wetlands 2-25

3. Reference Areas 3-1

3.1 On-Site Reference Areas 3-2

3.2 Off-Site Reference Areas 3-2

3.2.1 Step 1: Review of Existing Information 3-3

3.2.2 Step 2: Field Reconnaissance 3-5

3.2.2.1 Upstream Upper Hudson River 3-6

3.2.2.2 Lower Mohawk River 3-8

3.2.3 Preliminary Evaluation of Off-Site Reference Areas 3-10

3.2.4 Assessments of Off-Site Reference Stations 3-12

3.2.4.1 Upstream Upper Hudson 3-13

3.2.4.2 Lower Mohawk River 3-14

4. FCI Models 4-1

5. HSI Models 5-1

6. References 6-1

Tables (placed in text)

Table 1 Site-Specific Characteristics of Target and Reference Sampling Stations

Table 2 Classification Signatures for Delineating Aquatic Vegetation Bed, Riverine Fringing Wetland, Shoreline Habitats, and Adjacent Land Use

Table 3 Riverine Fringing Wetland Groundtruthing Data Points

Table 4 Photointerpretation and Delineation Error Matrix

Table 5 Side-Scan Sonar Debris Class

Table 6 Adjacent Land use and Riparian Zone Width Codes

Table 7 Comparison of Physical Features in Potential Reference Locations

Table 8 Riverine Fringing Wetland and Aquatic Vegetation Bed Habitat Characteristics in the Upstream Upper Hudson River

Table 9 Unconsolidated River Bottom and Shoreline Vegetation Habitat Characteristics in the Upstream Upper Hudson River

Table 10 Riverine Fringing Wetland and Aquatic Vegetation Bed Habitat Characteristics in the Lower Mohawk River

Table 11 Unconsolidated River Bottom and Shoreline Vegetation Habitat Characteristics in the Lower Mohawk River

Table 12 List of Potential Species for HSI Models

Figures

Figure 1 Upper Hudson River

Figures 2 through 15 Groundtruthing Station Locations for Habitat Delineation in the Upper Hudson River Project Area

Figure 16 Habitat Assessment Station Locations in the Upstream Upper Hudson River

Figure 17 Habitat Assessment Station Locations in the Lower Mohawk River

Appendices

A Groundtruthing Locations in the Project Area: Geographic Coordinates, Observed Species, and Map Changes

B Aquatic Vegetation Bed, Riverine Fringing Wetland, and Shoreline Species Observed in the Upper Hudson River

C Maps of the In-River Habitats and Adjacent Land Use in the Project Area (separately bound)

D Groundtruthing Locations in Potential Off-Site Reference Areas: Geographic Coordinates and Observed Species

E Side-Scan Sonar Debris Survey Code Descriptions

F Habitat Suitability Index Models for Key Species

Acronyms and Abbreviations

BBL	=	Blasland, Bouck & Lee, Inc.
BMI	=	benthic macroinvertebrate
cm	=	centimeter
DGPS	=	differential global positioning system
DO	=	dissolved oxygen
DQO	=	data quality objective
DVD	=	digital versatile discs
FCI	=	Functional Capacity Index
FEMA	=	Federal Emergency Management Agency
GE	=	General Electric Company
GI	=	Griffin Island
GIS	=	geographic information system
g/m^2	=	grams per square meter
HD Report	=	*Habitat Delineation Report*
HDA Work Plan	=	*Habitat Delineation and Assessment Work Plan*
HSI	=	Habitat Suitability Index
HGM	=	hydrogeomorphic
m	=	meter
m^2	=	square meter

mg/kg	=	milligrams per kilogram
mg/L	=	milligrams per liter
mm	=	millimeter
NA	=	not applicable
ND	=	Northumberland Dam
NOAA	=	National Oceanic and Atmospheric Administration
NWI	=	National Wetland Inventory
NYSDEC	=	New York State Department of Environmental Conservation
OSI	=	Ocean Surveys, Inc.
PDF	=	portable document format
Phase 1 DAD Report	=	*Phase 1 Dredge Area Delineation Report*
Phase 2 DAD Report	=	*Phase 2 Dredge Area Delineation Report*
Phase 1 HA Report	=	*Habitat Assessment Report for Candidate Phase 1 Areas*
Phase 2 HA Report	=	*Habitat Assessment Report for Phase 2 Areas*
PMI	=	phytophilous macroinvertebrate
QEA	=	Quantitative Environmental Analysis, Inc.
RD	=	remedial design
RD AOC	=	Remedial Design Administrative Order on Consent
RD Work Plan	=	*Remedial Design Work Plan*

RFW	=	Riverine Fringing Wetland
RM	=	River Mile
ROD	=	Record of Decision
SAV	=	submerged aquatic vegetation
s.d.	=	standard deviation
SHAWP	=	Supplemental Habitat Assessment Work Plan
SSAP	=	Sediment Sampling and Analysis Program
SSS	=	side-scan sonar
Supplemental SSAP-FSP	=	*Supplemental Sampling and Analysis Program-Field Sampling Plan*
TV	=	television
TOC	=	total organic carbon
UCB	=	Unconsolidated River Bottom
USACE	=	U.S. Army Corps of Engineers
USEPA	=	United States Environmental Protection Agency
USFWS	=	U.S. Fish and Wildlife Service
USGS	=	U.S. Geologic Survey Service

1. Introduction

1.1 Background

This revised *Habitat Delineation Report* (HD Report) is submitted by General Electric Company (GE) as part of the remedial design (RD) for the remedy selected by the United States Environmental Protection Agency (USEPA) for the Upper Hudson River. The RD program is established in the *Remedial Design Work Plan* (RD Work Plan) (Blasland, Bouck & Lee, Inc. [BBL], 2003a). Unless stated otherwise, the approach to the habitat delineation program described in this HD Report follows the scope of work described in the *Habitat Delineation and Assessment Work Plan* (HDA Work Plan) (BBL, 2003b). Both the RD Work Plan and the HDA Work Plan are part of the Administrative Order on Consent for Remedial Design (RD AOC) (USEPA and GE, 2003), which was executed in August 2003. The HD Report was originally submitted in April 2004 and has been further revised based on comments received from the USEPA, as well as additional information obtained since the submittal of prior versions of this report.

On February 1, 2002, the USEPA issued a Record of Decision (ROD) that calls for, among other things, the removal of substantial quantities of PCB-containing sediments from the Upper Hudson River (USEPA, 2002). In the ROD, the USEPA divided the Upper Hudson River into three sections (River Section 1, River Section 2, and River Section 3) (hereinafter referred to as the "Upper Hudson River" or the "project area"). These sections, illustrated on Figure 1, are defined as follows:

- *River Section 1:* Former location of Fort Edward Dam to Thompson Island Dam (approximately 6.3 miles);
- *River Section 2:* Thompson Island Dam to Northumberland Dam (ND) (approximately 5.1 miles); and
- *River Section 3:* ND to the Federal Dam at Troy (approximately 29.5 miles).

1.2 Goals of Habitat Delineation

The goals of the habitat delineation, as identified in the HDA Work Plan, are to:

- Document the nature and distribution of habitats that will potentially be affected by remedial activities;

- Identify reference habitat locations that represent the range of existing habitat conditions within the Upper Hudson River; and

- Identify potential off-site reference habitat locations for use in assessing watershed-wide conditions.

1.3 Data Quality Objective and Scope of this Report

The key data quality objective (DQO) for the habitat delineation is to determine the location and extent of existing habitat types within the 40-mile river section where sediment removal is proposed, and at suitable reference locations within and outside the Upper Hudson River (BBL, 2003b). This DQO required that data be collected on the distribution of habitats in the project area. Data were compiled from existing information (e.g., existing habitat maps), aerial photography (taken in July and August 2003), and field verification (conducted in August through October 2003, supplemented by additional field information collected during habitat assessment activities in 2004, 2005, 2006, and 2007). In addition, maps were prepared showing the location and spatial extent of habitats in the Upper Hudson River in 2003. Further, an investigation was conducted to evaluate the suitability of "offsite" reference areas in two river sections outside the project area – specifically, sections of the Hudson River upstream of the project area and within the Lower Mohawk River.

As described in the HDA Work Plan, habitats were delineated as:

- Unconsolidated (unvegetated) river bottom;

- Aquatic vegetation beds (SAV);

- Shoreline habitats, including maintained and natural shorelines; and

- Wetland habitats, specifically riverine fringing wetlands (RFW).

Pursuant to the HDA Work Plan, this HD Report presents the results of the habitat delineation activities conducted in 2003, supplemented by information obtained in 2004, 2005, 2006, and 2007. In 2003, aerial photographs were taken of the 40-mile project area and used to preliminarily identify habitat boundaries in the project area through photointerpretation. Following the completion of the photo-interpretation, groundtruthing was conducted over the project area to verify the habitat delineations, as well as in off-site reference areas in the Upper Hudson River upstream of the project area and in the Lower Mohawk River.

In addition to the habitat delineation activities, habitat assessment activities were conducted in 2003 and subsequent years, and included sampling both at target locations within dredge areas and at reference locations within the Upper Hudson River that are not subject to dredging, and off-site reference areas in the Upper Hudson River upstream of the project area and in the Lower Mohawk River. Specifically, habitat assessment activities were initiated for Phase 1 dredge areas in 2003. Several of those habitat assessment stations were resampled in 2004. In 2005, habitat assessments were conducted for the remaining Phase 1 habitat stations. In addition, in 2005, habitat assessments for areas that are candidates for Phase 2 dredging were initiated. In 2006, habitat assessments were conducted for the remaining Phase 2 habitat stations, and selected Phase 1 habitat stations were also resampled to evaluate interannual variability. In 2007, both reassessment locations and additional RFW locations were assessed in Phase 1 habitats. In addition, SAV stations were assessed in 2007 using a revised, randomized (i.e., centroid) sampling scheme. Habitat assessments were completed using the standard operating procedures (SOPs) described in the HDA Work Plan (BBL, 2003b), revised as described in the *Habitat Assessment Report for Candidate Phase 1 Areas* (Phase 1 HA Report; BBL and Exponent, 2005a). The modified SOPs are attached to the *Habitat Assessment Report for Phase 2 Areas* (Phase 2 HA Report; Quantitative Environmental Analysis, LLC [QEA], 2008b). A summary of site-specific characteristics of target and reference sampling stations is provided in Table 1. The locations at which habitat assessment data were collected in 2003, 2004, 2005, 2006, and 2007 are shown on the habitat delineation maps provided in Appendix C and in shape files. Refined habitat delineation information collected during habitat assessments also is incorporated on the delineation maps provided in Appendix C. However, the habitat assessment data themselves are presented in other documents – namely, the Phase 1 HA Report (supplemented with a 2007 Habitat Assessment Data Summary Report) and the Phase 2 HA Report.

1.4 Format of HD Report

The remainder of this HD Report consists of the following sections:

- Section 2 details the overall approach, sources of information, and methods used to produce maps delineating each of the four habitats.

- Section 3 describes the on-site and potential off-site reference areas (located in the Hudson River upstream of the project area and in the Lower Mohawk River) that were surveyed during the fall of 2003 and the summer of 2006.

- Section 4 notes that the derivation and potential use of Functional Capacity Index (FCI) models previously covered in that section are currently under discussion by GE and USEPA as part of their collaboration on the development of alternative success criteria, as detailed in Exhibit A of the *Phase 1 Adaptive Management Plan* (Phase 1 AM Plan; QEA, 2008a).

- Section 5 presents the list of species for which Habitat Suitability Index (HSI) models will be used as a supplement to the FCI models or other success criteria measures, if necessary, to assess the fish and wildlife habitat functions of the project area for certain species.

- Section 6 contains a list of the references that were used to prepare this HD Report.

In addition, a number of appendices are included in this report to provide more detailed information on the habitat delineation activities, as well as the final habitat maps. These appendices include: the habitat delineation groundtruthing locations within the project area, plant species observed at these locations, and changes made to the preliminary habitat maps based on the groundtruthing (Appendix A); plant species observed in aquatic vegetation beds, riverine fringing wetlands, and shoreline assessment stations (Appendix B); hard copy maps of the in-river habitat and adjacent land use within the project area (Appendix C); groundtruthing locations in potential off-site reference areas and plant species observed (Appendix D); side-scan sonar debris survey code descriptions (Appendix E); and habitat suitability index models for selected species (Appendix F).

The hard copy habitat delineation maps provided in Appendix C show the boundaries for the following information:

- Sediment types;

- Natural and maintained shoreline areas;

- Adjacent land use;

- Aquatic vegetation beds (submerged and floating);

- Floating aquatic vegetation;

- *Trapa natans*;

- Riverine fringing wetlands;
- Backwater wetlands;
- Debris/debris areas identified using side scan sonar;
- Surface grain size sample locations;
- Surface total organic carbon sample locations;
- Groundtruthing station locations;
- Data gap probing locations; and
- Habitat Assessment station locations.

This report includes a hardcopy of the habitat delineation maps and electronic versions of the GIS shapefiles used to produce the maps. The March 30, 2006 version of the HD Report electronic include data layers for the information listed above as ArcReader "published map files", with and without orthorectified vertical aerial photographs, on digital versatile discs (DVDs). That HD Report also had an additional set of DVDs that contained only the orthorectified vertical aerial photographs which were used as the basis for the delineation maps Based on discussions with EPA, it was agreed that this revised HD Report need not include those ArcReader maps or the additional DVDs with the orthorectified vertical aerial photographs.

This HD Report uses English or metric units of measurement consistent with the standard practice for the data being reported. Where appropriate, English conversions are applied to metric units reported in the text or shown in the tables.

2. Habitat Delineation

2.1 Overview of Approach

The four habitat types (unconsolidated river bottom, aquatic vegetation bed, shoreline, and riverine fringing wetlands) of the Upper Hudson River potentially impacted (directly or indirectly) by the remedial activities were delineated in accordance with the HDA Work Plan using the following four-step process.

Step 1: Review of Existing Information - This step involved reviewing existing information relevant to delineating the habitats in the Upper Hudson River. That information included existing maps of the area (e.g., New York State Department of Environmental Conservation [NYSDEC] and U.S. Fish and Wildlife Service [USFWS] National Wetland Inventory [NWI] maps), existing aerial photography, historical aerial photography of the project area, existing reports (e.g., Exponent, 1998; Law Environmental, 1991), and available information collected under the Sediment Sampling and Analysis Program (SSAP) performed by GE in 2002 to support the RD (e.g., side-scan sonar [SSS] data). The specific information reviewed and its use for each habitat type is described in subsections 2.2.1 through 2.2.4.

Step 2: Aerial Photography and Photo Interpretation, Preliminary Delineation Maps - This step involved taking new aerial photographs in 2003 specifically for the habitat delineation program, interpreting those photographs, and developing preliminary delineation maps for each of the four habitats based on information collected during Step 1 and the photo interpretation of the new (2003) aerial photography.

Step 3: Field Verification of Preliminary Habitat Maps - In this step, the preliminary delineation maps were taken into the field, beginning with the 2003 field season, for verification through groundtruthing. Groundtruthing included two distinct tasks: 1) "spot-checking" specific areas identified from the aerial photographs to confirm the habitat designations and delineations based on the photographs; and 2) collecting field survey observations of the 40-mile project area to identify and delineate habitats that were not readily discernible on the aerial photographs. Spot-checking involved selecting specific locations on the aerial photographs on the basis of their signatures for subsequent verification in the field. In 2003, spot-checking was conducted at a total of 13 unconsolidated bottom locations, 21 aquatic vegetation beds, 14 shoreline areas, and three wetlands. Numerous points were examined within each of the habitat types during spot-checking. The frequency and density of spot-checking were consistent with the amount of dredging currently planned in each river section (i.e., highest in River Section 1 and lowest in River Section 3 on a per-area basis). The spot-checking conducted in 2003 facilitated

the delineation of habitats. In addition to the spot-checking, the 40-mile river area was field surveyed to compare the in-field conditions with the preliminary habitat delineation maps and to identify and delineate habitats that could not be clearly identified on the aerial photographs. The specific locations at which groundtruthing activities were conducted are shown by habitat type on Figures 2 through 14, and are listed, by geographic coordinates, in Appendix A; the vegetation species observed at the aquatic vegetation bed, shoreline, and riverine fringing wetland habitats are also listed in Appendix A.

Spot-checking habitat boundaries was also completed as part of the habitat assessments in subsequent years. This latter type of spot-checking involved a visual assessment of the delineated habitat boundaries, in particular for SAV, prior to the collection of assessment data. When delineated boundaries had clearly changed from those indicated on the habitat delineation figures, those boundaries were modified to reflect current conditions. Specifically, in 2004, eight stations were reassessed (two unconsolidated river bottom stations, one aquatic vegetation bed station, four shoreline stations and one riverine fringing wetland station). In 2006, 26 habitat stations were reassessed (six unconsolidated river bottom stations, 12 aquatic vegetation bed stations, six shoreline stations and two riverine fringing wetland stations). In 2007, four unconsolidated river bottom stations, six shoreline stations and two wetlands were reassessed. In addition, the remaining six riverine fringing wetlands present in Phase 1 areas were also sampled. The sampling procedure for SAV was revised in 2007 as described in the modified SOP (Appendix C of the Phase 2 HA Report (QEA, 2008b). One hundred and fifty eight (158) aquatic vegetation locations in the Phase 1 areas were sampled in 2007.

The results from this spot-checking from 2003 through 2007 were incorporated into the habitat boundaries shown on the figures in Appendix C of this HD Report.

Subsequent spot checking/reassessment in field seasons before dredging begins will be conducted in accordance with the approach described in Section 6.6 of the USEPA-approved Phase 1 HA Report (BBL and Exponent 2005a). Prior to conducting these reassessments, GE will propose the reassessment stations to be assessed, including the allocation among habitat types, based on field conditions and data needs, to USEPA for review and approval. The reassessment results will be provided to the USEPA in an appropriate subsequent report.

Step 4: Digitized Habitat Maps - In this step, maps were produced by digitizing the delineated habitat boundaries and overlaying them on orthorectified aerial photographs. The digitized maps were then compared to field-verification maps, field notes, and original aerial photographs to ensure that the digital maps accurately reflected the information

sources. The digitized habitat maps showing the location and spatial extent of the four habitat types in the Upper Hudson River are provided in Appendix C. As discussed above, these maps are also provided electronically on a DVD accompanying this HD Report as both portable document format (PDF) files and GIS shapefiles.

Each of the four steps in the HD process is described in more detail in the following subsections. Habitat delineation of the land-based sediment processing facility is beyond the scope of this HD Report.

2.2 Step 1: Review of Existing Information

Available information was compiled and reviewed for the preliminary delineation of unconsolidated river bottom, aquatic vegetation bed, shoreline, and riverine fringing wetland habitats as described in the subsections below. In addition, historical aerial photographs of the Upper Hudson River available through the New York State Center for Geographic Information in Albany, NY were reviewed for comparison with the 2003 photographs to evaluate whether and how historical habitat conditions had changed. Historical aerial photographs of the project area were available for the period 1947 through 2000. The 2001 digital orthoimagery from NY State was not used because it was only available in color infrared, and subsequently developed digital orthoimagery (i.e., 2004, 2007, and 2008) was not available at that time. The majority of the available historical aerial photographs were taken in March, April and May. These photographs provide information on the land use adjacent to the project area; however, they provide only limited information on the distribution of aquatic vegetation beds and riverine fringing wetlands since the signature vegetation for these habitats is not visible on aerial photographs during this period. Aerial photographs are available for August 1990 and show the presence of water chestnut (*Trapa natans*) beds, wetlands, and surface signatures of floating aquatic vegetation within the project area. This information is discussed in greater detail for the specific habitat types in the following subsections.

2.2.1 Unconsolidated River Bottom

River bottom not delineated as aquatic vegetation beds is classified as unconsolidated (unvegetated) river bottom. This category includes some relatively small areas of exposed bedrock and a wide-range of substrate types (i.e., cobble, sand, and silt) and debris. Two principal sources of existing information were reviewed to initially delineate unconsolidated river bottom habitat, including: 1) preliminary data from aquatic vegetation maps produced by Law Environmental (1991) and Exponent (1998); and 2) the SSS data and supplemental groundtruthing data, including sediment probing and confirmation core data that were

collected by Ocean Surveys, Inc. (OSI) as part of the SSAP (OSI, 2003a, b). OSI used the SSS data in its categorization of the sediments into five subclasses of sediment types, which were presented in the *Data Summary Report for Candidate Phase 1 Areas* (QEA et al., 2004a) and *Phase 2 Data Summary Report* (QEA et al., 2004b). These subclasses were used in the habitat delineation effort to classify the unconsolidated river bottom based on sediment type, as discussed further in subsection 2.6.1, below. In addition, the SSS data were used to identify areas of the river bottom containing submerged debris.

Probing data collected in data gap areas in 2003 (QEA et al. 2004a) are also shown in addition to the SSS data. In addition, data gap probing was completed to fill in data gaps for those areas that could not be accessed with the side-scan sonar and to assist in the interpretation of the SSS data. Those data gap locations are shown on the maps and the information was incorporated into the sediment type mapping. (A separate type of data gap sampling was completed in 2004 and 2005 to assist in delineating the dredge area boundaries rather than confirm or alter sediment type boundaries. As such, those data are not included in the habitat delineation report and maps.) The probing data provide a finer scale resolution than the sediment types delineated by the SSS, and in some instances the sediment type indicated by the probing data are different from the sediment type indicated by the SSS, as the probing data represent an area of several inches, where the SSS data represent an area on the order of acres.

2.2.2 Aquatic Vegetation Beds

Aquatic vegetation bed maps provided in the Law Environmental (1991) and Exponent (1998) reports were used for preliminary documentation of the distribution of vegetated river bottom habitat, particularly in River Section 1. These maps were used primarily to locate areas known to support aquatic vegetation beds to aid in identifying those signatures on aerial photography. In addition, the interpreted SSS data and data gap probing data were used to assist in differentiating between unconsolidated and vegetated river bottom areas and, in some cases, in identifying and verifying aquatic vegetation bed locations. As indicated in subsection 2.2 above, available historical aerial photographs of the project area were reviewed to determine whether the location and extent of current aquatic vegetation beds have changed with time. The August 1990 photographs show several features, including the presence of water chestnut beds at the west side of Griffin Island, Coveville, Stillwater, Mechanicsville, Lock 2, and north of Quack Island. The August 1990 aerial photographs also indicate the surface signatures of floating aquatic vegetation near River Mile 193, above Thompson Island Dam, at Schuylerville and above Stillwater on the west side of the channel.

2.2.3 Shorelines

No existing information was available to preliminarily characterize shoreline habitats as either maintained or natural (i.e., unconsolidated shore, as defined by Cowardin et al., 1979) (see also HDA Work Plan [BBL, 2003b] for definitions). The August 1990 historical aerial photographs show that the adjacent land use is primarily residential and industrial mixed with agricultural between Locks 1 and 4, and largely agricultural between Locks 4 and 7. A narrow band of trees generally separates the active agricultural areas from the river.

2.2.4 Riverine Fringing Wetlands

Wetlands in the Upper Hudson River that could potentially be impacted by remediation activities (i.e., those along the immediate shoreline of the Upper Hudson River) are relatively small, fringing, emergent wetlands. A new hydrogeomorphic (HGM) subclass of "riverine fringing" wetlands has been used to classify the Hudson River wetlands. Riverine fringing wetlands possess characteristics similar to traditional HGM classes of riverine and tidal fringe, but riverine fringing wetlands have a unique combination of HGM setting and hydrodynamics. Benches or slopes inside the river banks provide the HGM setting for riverine fringing wetlands, and within-channel flow is the dominant water source. Hydrodynamics have both vertical and horizontal components. The vertical component results from seasonal changes in precipitation and evapotranspiration in the watershed and episodic changes due to hydrofacilities on the river. The horizontal component results from non-tidal river flow.

Several existing sources of information were reviewed in an effort to identify such wetlands, including existing NWI and NYSDEC wetland maps of the project area, U.S. Geological Survey (USGS) topographic maps, Federal Emergency Management Agency (FEMA) maps of the area, Natural Resource Conservation Service soil surveys, and the Law Environmental (1991) aquatic vegetation maps.

The August 1990 historical photographs indicate the occurrence of large wetlands at the west shore above Thompson Island Dam, below Lock 6, Northumberland Bridge, Coveville, east and west shores above Lock 2, and north of Quack Island.

The HDA Work Plan also stated that in the event that wetlands from other riverine HGM subclasses, such as sheltered wetlands, are identified as being directly impacted by dredging, those wetlands would also be delineated. Based on the *Phase 1 Final Design Report* (Phase 1 FDR, BBL, 2006), Phase 1 of the dredging program would not directly

impact any such wetlands. In addition, based on the *Phase 2 Dredge Area Delineation Report* (Phase 2 DAD Report, QEA, 2007), it does not appear likely that Phase 2 dredging would directly impact any such wetlands.

2.2.5 Data Gaps

To the extent available, historical information collected for each of the four habitat types was used to aid in the habitat delineation process. Historical information was useful for providing preliminary information on the distribution of habitats, particularly for unconsolidated river bottom, aquatic vegetation bed habitats, and larger wetlands. No existing information was available to characterize shorelines as either maintained or natural, or to determine the location of most riverine fringing wetlands and other wetlands smaller than 12 acres. Historical information was either dated (e.g., Law Environmental, 1991) or at a scale that may have been too small to detect the small size of the riverine fringing wetland habitats. For all habitats except unconsolidated river bottom (where surveys were conducted as part of the RD Program), the historical information was incomplete for habitats in River Sections 1, 2, and 3. As a result, the additional steps described below were performed to satisfy those data gaps.

2.3 Step 2: Aerial Photography and Photo Interpretation, Preliminary Delineation Maps

Methods modified from *Guidance for Benthic Habitat Mapping: An Aerial Photographic Approach* (National Oceanic and Atmospheric Administration [NOAA], 2001) were used to develop preliminary maps of habitats in the Upper Hudson River in 2003. Specifically, the four habitats (unconsolidated river bottom, aquatic vegetation bed, shoreline, and riverine fringing wetlands) were delineated from 2003 aerial photographs. NOAA (2001) guidelines were developed for mapping benthic habitats in tidal waters; the Upper Hudson is not tidal, consequently methods to account for tidal changes were not incorporated into the aerial photograph acquisition or groundtruthing procedures. Additionally, the NOAA (2001) guidelines state that aquatic vegetation is at a peak during June. However, most species of aquatic vegetation in the Upper Hudson River reach their peak (biomass or vegetation height) in July through mid-September. This was accounted for in modifying the guidance. Aerial photographs were acquired in July and August 2003.

As described in the HDA Work Plan, interpretation of vertical and oblique aerial photography was the primary method used to delineate aquatic vegetation bed, riverine fringing wetland, unconsolidated river bottom (by default, river bottom areas where no aquatic vegetation beds were mapped), and shoreline habitats. Vertical aerial photographs

used for photo interpretation were taken on July 29, 2003, with the exception of two images near Galusha Island that were taken on August 15, 2003 (that area had been inadvertently missed during the first flight). Additional vertical aerial photographs were taken on October 13, 2003 to aid in the orthorectification process, but not for delineation. Oblique aerial photographs were taken on July 30 and 31, 2003. Because of sun angle interferences in the July oblique photos, additional oblique aerial photographs of the east shoreline were taken on August 15. Delineation photography was conducted during the peak vegetation growing season (typically July through mid-September for the Upper Hudson River).

The following image acquisition protocols were used in the vertical aerial photography:

- Color negative film;
- Flight lines with a minimum 30% sidelap and 60% forward overlap to ensure stereoscopic images;
- 1" = 1,000' scale;
- No substantial rainfall or wind events within 48 hours of image acquisition;
- 30- to 45-degree sun angle; and
- Less than 5% cloud cover.

Note that the vertical aerial photographs were taken at a scale of 1"=1000' (rather than 1"=200', as indicated in the HDA Work Plan) to facilitate acquiring imagery of the entire 40-mile project area with a reasonable number of photographs that could be interpreted, mapped, and groundtruthed within the same field season. This enlargement factor (5x) is within the USACE photogrammetric mapping standards (USACE, 2002). The resolution of the images allowed for the project area to be enlarged to the 1"=200' scale as needed to aid in interpretation and delineation. As discussed below, these photographs were enlarged and digitally orthorectified to create the final habitat delineation maps at a scale of 1"=200' in accordance with the HDA Work Plan.

Following acquisition, the vertical aerial photographs were interpreted in accordance with the following guidelines. A classification system was used to facilitate interpretation of in-river habitats and identify land use immediately adjacent to the river (see Table 2, below). Interpretation was conducted using stereo pairs of the vertical aerial photographs and a Sokkia MS27 mirror stereoscope at 3x magnification. The stereoscope was useful for

delineating nearshore areas where riparian vegetation partially obscured aquatic vegetation beds or riverine fringing wetlands. Hand held lenses with 5x and 10x magnification were also used for delineating aquatic vegetation beds in areas where vertical separation was not needed to accurately delineate the habitat. The density of the aquatic vegetation beds and water chestnut beds were indicated on the maps according to a modified crown density scale (adapted from Orth et al., 1991 and Steeves et al., 1999). River areas that were not delineated as aquatic vegetation bed, water chestnut, or riverine fringing wetland were mapped as unconsolidated river bottom habitat.

For areas partially obscured by riparian vegetation, the oblique aerial photographs were also used to help identify habitat types and boundaries to the extent possible. In addition, the oblique aerial photographs were used to preliminarily delineate natural and maintained shoreline areas. Tributaries to the Upper Hudson River were not delineated or mapped.

After the interpretation of the aerial photographs, the approximate boundaries of the identified habitats were transferred onto 1"=200' scale base maps created from aerial photographs flown in the spring of 2002 by Chas H. Sells, Inc., and these maps were used for groundtruthing (described in the next section). It was not possible to digitize the habitat boundaries interpreted from the aerial photographs to produce maps for use in the 2003 field groundtruthing activities, due to: 1) the significant amount of time required to color check and print the photographs and to produce orthorectified digital images to use as the base map for digitizing identified habitat boundaries; and 2) the need to conduct the groundtruthing activities promptly and to complete the habitat assessment field work for the candidate Phase 1 areas in the 2003 field season. Therefore, the interpreted boundaries were promptly transferred onto the existing 1"=200' scale base maps for use in groundtruthing (i.e., spot-checking and field surveys), and the 2003 aerial photographs were subsequently used to produce orthorectified digital images to serve as the base map for the final 1"=200' scale habitat delineation maps, as described in subsection 2.5 below.

Table 2 – Classification Signatures for Delineating Aquatic Vegetation Bed, Riverine Fringing Wetland, Shoreline Habitats, and Adjacent Land Use

Classification – In River	Signature
Aquatic Vegetation Bed	Light green to green-brown to brown color and smooth to bumpy texture. Signature varied based on water-depth and species composition. Aquatic vegetation beds were mapped as a single class although the beds include several species of submerged aquatic vegetation (SAV) and floating aquatic vegetation.
Water Chestnut	Light green to yellow-green leaves and smooth texture. Water chestnut beds are a type of aquatic vegetation bed but were mapped separately because it is an invasive species.
Riverine Fringing Wetland	Dark green to light green to light brown color with mottled and bumpy texture. Signature varied based on species composition. Floating aquatic vegetation occasionally present (light green to yellow-green color).
Shoreline	Natural shoreline areas indicated by presence of dense vegetation (light green to dark green with varying texture). Maintained areas are generally indicated by lack of vegetation and/or presence of impervious surface, but also include lawns, golf courses, and agricultural fields.
Classification – Adjacent Land Use	**Signature**
Cropland / Row Crops	Light brown to light green to dark green colors. Areas generally flat or gently sloped bordered by trees. Parallel lines are generally present and indicate agricultural management practices (e.g., tilling).
Pastureland	Light brown to light green to dark green colors. Areas generally flat or gently sloped bordered by trees. No indication of agricultural management practices (e.g., tilling).
Floodplain	Light green to dark green intermixed with dark brown to black areas (indicating water). Varying vegetation heights depending on species, but trees generally present.
Classification – Adjacent Land Use	**Signature**
Maple/Basswood Rich Mesic Forest	Dark green to green-brown color with bumpy to mottled texture. Heights vary depending on species composition.
Emergent	Light green to dark green intermixed with dark brown to black areas (indicating water). Vegetation heights limited.
Mowed Lawns with Trees	Light green to dark green. Smooth texture over a homogenous area often bordered by trees. House(s) present. Includes both residential and recreational areas.
Development/Infrastructure	Colors and texture varied. Indicated by presence of buildings and/or impervious surfaces.

2.4 Step 3: Field Verification of Preliminary Habitat Maps

Groundtruthing of the entire 40-mile project area was conducted in the 2003 growing season before wetland and SAV plant senescence. Groundtruthing was conducted from August 27 to September 18, 2003, and included two distinct tasks: "spot-checking" specific areas identified from the aerial photographs; and a field survey of the entire 40-mile project area to identify and delineate areas that were not readily discernible on the aerial photographs. In general, groundtruthing efforts were concentrated in River Sections 1 and 2, with a lower level of effort in River Section 3, consistent with the amount of remedial activity that is probable in each river section (BBL, 2003b). During groundtruthing, the preliminary boundaries of each habitat determined through interpretation of the aerial photographs were adjusted as necessary based on direct observations. In addition, habitat features not visible from the aerial photographs, such as linear aquatic vegetation beds, riverine fringing wetlands, and shoreline features partially obscured by riparian cover, were added to the preliminary maps (Eckerlin and Bain, 2003; Schulz et al., 2003; Nieder et al., 2004). The locations of the habitats identified in the field were recorded on the 1"=200' preliminary maps using reference landmarks and/or differential global positioning system (DGPS). All DGPS data points were post-processed prior to inclusion on the final maps provided as Appendix C.

For groundtruthing, a pontoon boat equipped with an outboard engine was navigated through River Sections 1, 2, and 3. Separate teams for each habitat type were equipped with the appropriate preliminary maps and aerial photographs, and as the boat moved along the river, the teams verified or adjusted, as necessary, the preliminary habitat delineations. The specific locations at which the boat stopped to complete groundtruthing activities are listed, by geographic coordinates, in Appendix A and are shown on the habitat maps presented in Appendix C and on Figures 2 through 14.

The pontoon boat that was used to field-verify habitats could not access the land-locked area between the Fort Miller Dam and the Thompson Island Dam. Therefore, for this land-locked area, a small Jon boat with an outboard motor was used to groundtruth habitats using the same methods as those in other river sections.

Additional field verification of the aquatic vegetation bed, unconsolidated river bottom and riverine fringing wetland boundaries was completed as part of the habitat assessments and reassessments in 2004, 2005, 2006, and 2007, as described in the following subsections.

Specific field verification methods and finalized habitat maps for each habitat type are also described in more detail in the following subsections.

2.4.1 Unconsolidated River Bottom

SSS data were field verified during the SSAP investigations (OSI, 2003a, b), and therefore field verification of those data was not repeated as part of the habitat delineation program. To ground truth the sonar imagery data, push probing was conducted at 1,895 locations during surveys of River Sections 1 and 3 in 2002 and at 467 locations during the 2003 survey of River Section 2. An onboard geologist performed the push probing while the survey vessel was surveying on-line. Push probing into the bottom while surveying is relatively simple and immediately provided information to the geologist about the bottom sediments, and later added to the final interpretation and mapping of sediment distribution. The probing results and coordinates were logged as target files using the sonar acquisition software. Probing results and sonar images were evaluated during the course of the survey to determine locations for confirmatory grain size sampling in each river section.

The confirmatory sediment sampling for grain size was conducted at 146 locations in River Section 1, 133 locations in River Section 2, and 150 locations in River Section 3. The locations at which confirmatory samples were collected were selected by OSI's geophysical specialist and a QEA representative based on a cursory review of the sonar imagery in the field (OSI, 2003a). Cores were collected in 3-inch (outside diameter) Lexan® tubing using push coring techniques. The sediment cores were extruded on the sampling vessel and the top 1 inch (the depth to which the side-scan sonar can penetrate) was collected for grain size measurement. On average, four cores were collected at each location to assure proper sample volume. In areas where sediment cores could not be collected, ponar grab samples were collected. The samples then underwent laboratory grain size analysis. The *Data Interpretation Report - Side Scan Sonar Survey Investigation for Hudson River - River Sections 1 and 3, Fall 2002* (OSI, 2003a), which includes tabulated results of the confirmatory core grain-size analyses, was presented as an appendix to the *Supplemental Sediment Sampling and Analysis Program-Field Sampling Plan* (Supplemental SSAP-FSP (QEA, 2003). Tabulated grain size results for confirmatory cores collected in River Section 2 were included in the *Data Interpretation Report - Side Scan Sonar Survey Investigation for Hudson River - River Section 2, Spring 2003* (OSI, 2003b) submitted to the USEPA in October 2003.

In addition to the confirmatory sediment sampling, data gap probing was conducted in 2003 in areas that were not covered by the side scan sonar survey. The goal of the probing was to identify areas of fine-grained sediment that should be included in the coring program. The results of the data gap probing are shown on the maps in Appendix C. Additional data gap probing was conducted in 2004 and 2005 data gap probing was completed to assist in delineating dredge areas rather than sediment type mapping and are not included in this

report. The results for the 2004 data gap sampling are provided in the *Supplemental Delineation Sampling Program Data Summary Report* (QEA and ESI, 2005). The results for the 2005 data gap sampling are provided in the *Supplemental Delineation Sampling Program Data Summary Report* (QEA and ESI, 2006). No data gap probing was conducted in 2006 or 2007.

Preliminary delineations of unconsolidated river bottom habitats were verified through spot-checking of representative areas in each river section that were not initially delineated as aquatic vegetation beds. To verify that no aquatic vegetation was present, an underwater video camera (Seaviewer Sea-Drop™ 550 Series) linked to an Action® 5-inch color television (TV) monitor was lowered from the boat to observe the bottom. This process was repeated in 2003, 2004, 2005, 2006, and 2007 prior to conducting habitat assessments/reassessments at the unconsolidated river bottom stations.

2.4.2 Aquatic Vegetation Beds

For groundtruthing of aquatic vegetation habitats, the vessel covered areas less than 4.5 meters (m) (15 feet) deep and outside of the navigation channel in the project area. Previous aquatic vegetation bed delineation in the Upper Hudson River showed that the beds are rarely present in waters deeper than 9 feet, primarily due to light limitation (Exponent, 1998). Data collected for this program indicate that aquatic vegetation beds are most likely to occur within the 4 to 6 foot depth range (at 5,000 cfs). At spot-checking locations (i.e., those locations where questions about signatures on the aerial photographs or previous habitat delineation information existed), the vessel was positioned over the shallow edge of the aquatic vegetation bed and the position was recorded with a DGPS unit. The vessel moved along a transect perpendicular to the river and when depth, species composition, or water clarity changed, the vessel stopped and the location was recorded with a DGPS unit. If plants could not be identified from the surface, an underwater video camera (Seaviewer Sea-Drop™ 550 Series) linked to an Action® 5-inch color TV monitor was lowered from the boat to observe any aquatic vegetation. The vessel continued to move away from shore, out of the aquatic vegetation bed, across the channel and into the aquatic vegetation bed (if any) on the opposite shore. The percent cover of the bed was determined based on visual observations from two observers and the average of the two observations recorded on the preliminary habitat maps. Data collected were recorded in field logbooks and species are listed, in order of dominance, in Appendix A.

At field survey locations, the vessel was positioned over the deep edge of the aquatic vegetation bed. The location of the deep edge was initially determined using an on-board depth finder. This instrument provided suitable resolution for initially determining the

presence or absence of the aquatic vegetation. To verify the extent of aquatic vegetation, an underwater video camera (Seaviewer Sea-Drop™ 550 Series) linked to an Action® 5-inch color TV monitor was lowered from the boat to observe the deep edge of the aquatic bed. A distance range finder (Bushnell® Digital Yardage Pro) was used to compare and, if necessary, correct the distance of the deep edge from the shoreline on the preliminary maps. Changes to the preliminary delineation lines made during the groundtruthing are summarized in Appendix A. The percent cover of the bed was determined based on visual observations from two observers and the average of the two observations recorded on the preliminary habitat maps. At several groundtruthing station locations, small patches of aquatic vegetation were identified. These small patches were isolated, most likely ephemeral patches, consisting of a few plants of a single species. (Appendix A provides a list of species observed at each groundtruthing location.)

Water chestnut, a floating exotic species that sometimes occurs in slower-flowing areas of the Hudson River, provides a unique surface signature and is easily delineated from the aerial photographs. Water chestnut beds were mapped from the aerial photographs, and the boundaries were field-verified through visual observations of their floating leaves. As stated in the HDA Work Plan, the water chestnut beds were identified for purposes of mapping, but the replacement of these beds with water chestnut (if impacted by remedial activities) will not be a component of any restoration or replacement effort because water chestnut is an invasive (nuisance) species. Rather, in areas where water chestnut or other invasive species are removed as part of the remediation, habitat replacement efforts will focus on providing suitable conditions for recolonization of the area by a desirable non-invasive native species, and/or active planting of a more desirable native species at the appropriate time, in accordance with the approved project documents. In addition to water chestnut, the presence of other invasive/exotic species observed during the groundtruthing at a given station was recorded. The list of species is provided in Appendix A and can be viewed in attribute tables of the GIS shapefiles provided on the accompanying DVD.

Many pondweed species (*Potamogeton* spp.) could also be readily distinguished from the signature created by their floating leaves on the aerial photographs. These species are generally found mixed with wild celery in non-*Trapa* aquatic vegetation beds. However, some pondweed species do not have floating leaves and others have floating leaves only during certain portions of the growing season. The delineation maps include only those areas of floating aquatic vegetation present at the time the photographs were taken. Groundtruthing and spot-checking activities were completed to delineate non-*Trapa* aquatic vegetation beds and *Trapa* beds. The species observed during the field verification of the aquatic vegetation beds (including invasive/exotic species) are listed in Appendix A in order of dominance.

Prior to the initiation of habitat assessments, the boundaries of the aquatic vegetation beds were compared with the delineation maps to verity the location and size of the beds. The boundaries for several aquatic vegetation beds were adjusted in 2005 and 2006 as a result of these comparisons (no changes were made in 2007). The revised boundaries are included in the maps provided in Appendix C. Further, beginning in 2006, the beds were delineated by species to the extent possible. Confirmation of the boundaries and species composition will be completed prior to conducting future habitat assessments, and the aquatic vegetation beds at which subsequent habitat assessments are conducted will be further delineated by species to the extent possible (e.g., depending on water levels). The results of the refined delineations will be provided in subsequent habitat assessment reports or design reports as appropriate.

2.4.3 Shorelines

Field verification of shoreline characteristics was conducted along transects established parallel to the shoreline. The vessel was positioned at a location along the shoreline and the location recorded with a Leica GS50 DGPS unit with an RTB Antenna and a positional accuracy of 1 to 3 m. A video camera (JVC Model GR-D70) was started and the vessel proceeded approximately 300 to 500 m to the end of each transect. While the vessel was underway, team members recorded shoreline vegetation species composition. Another team member reviewed the preliminary habitat maps and made revisions as needed to indicate shoreline areas as maintained or natural. The composition of vegetation species along the slope of the shoreline and on the riparian edge (above the bank), if observed, was recorded in field notebooks. Shoreline vegetation species that were observed during groundtruthing are listed in Appendix A.

2.4.4 Riverine Fringing Wetlands

Field verification of riverine fringing wetland habitats was done in conjunction with shoreline field verification. Riverine fringing wetlands were also identified in the field and added to the maps using reference landmarks and/or DGPS during this process. As such wetlands were identified, the vessel was positioned at the upriver edge, center, and/or downriver edge of the fringing wetland (depending on the size of the wetland) and the locations recorded with the DGPS unit. A member of the wetland team recorded plant species composition in a field log book. The locations of wetlands measuring less than 5 square meters (m^2) were not recorded as these wetlands were isolated, most likely ephemeral patches consisting of a few plants of a single species. The occurrence of these smaller wetlands was noted during subsequent habitat assessments, starting in 2006. Wetlands measuring between 5 and 25 m^2 were mapped with a single point located at the center of the wetland. Based on the

accuracy of the DGPS unit and the map scale, additional points would not be discernible on the maps. For wetlands measuring greater than 25 m^2, both the upstream and downstream ends of wetlands were recorded. Table 3 (below) lists the information that was recorded, according to the size of the wetland. The wetland plant species observed at each groundtruthing station are listed in Appendix A.

Table 3 – Riverine Fringing Wetland Groundtruthing Data Points

Wetland Size (m_2)	Information Recorded
< 5	- None (no DGPS prior to 2006)
5 to 25	- Center of wetland recorded with DGPS - Plant species identified - Digital photograph(s) taken
> 25	- Upriver and downriver edge of wetland recorded with DGPS - Plant species identified - Digital photograph(s) taken

Note:
1. Information on the location of small isolated riverine fringing wetlands was scheduled to be collected starting in 2006. However, in 2006, these wetlands were not present, likely due to persistent high water levels during the 2006 growing season.

The HDA Work Plan indicates that wetlands which will be directly impacted by remediation activities, as well as reference wetlands, will be further delineated in accordance with the three-parameter approach set forth in the 1987 U.S. Army Corps of Engineers (USACE) *Wetland Delineation Manual*. This could not be accomplished during prior habitat delineation activities since the *Phase 1 Dredge Area Delineation Report* (Phase 1 DAD Report, QEA 2005) was not approved until March 30, 2005, and the *Phase 2 Dredge Area Delineation Report* (Phase 2 DAD Report, QEA, 2007) was not approved until November 17, 2007. As a result, the riverine fringing wetlands identified were field verified and their positions were recorded with the DGPS unit and on the maps in Appendix C, but they were not further delineated at that time in accordance with the USACE *Wetland Delineation Manual* (USACE, 1987). In addition, in some cases, small backwater areas or irregular cuts in the shoreline that support small areas of riverine fringing wetlands are bordered by larger wetlands. Such larger wetlands were not mapped or delineated, since they will be not be directly impacted by remedial activities.

The riverine fringing wetlands present within the Phase 1 dredge areas were shown in the Phase 1 FDR (BBL, 2006). These wetlands were further delineated in accordance with the three-parameter approach set forth in USACE *Wetland Delineation Manual*, and the results were provided to USEPA in the 2007 *Habitat Assessment Data Summary Report* (which is currently under USEPA review). In Phase 2 areas, the riverine fringing wetlands that will be

directly impacted by the dredging activities were further delineated beginning in 2008 in accordance with the USACE *Wetland Delineation Manual* and the results will be provided in the Phase 2 Final Design Report. For this reason, wetland areas indicated on the accompanying HDR mapping may differ from previous HDR mapping and may also differ from final Phase 2 FDR wetland mapping.

2.4.5 Mapping Accuracy

Remote sensing and photo interpretation of large areas always carry a degree of uncertainty, but the spatial extent can often preclude field-based mapping (Nieder et al. 2004). As stated in Nieder et al. (2004), a random, depth-stratified groundtruthing approach can be used to quantitatively assess the likelihood of errors. However, as discussed in subsection 2.3.1 above, the final maps were not available for use in a stratified random sample approach to verify the mapping accuracy. As a result, the 1"=200' scale base maps described in subsection 2.3.1 were used to groundtruth (i.e., spot-check and field survey) the entire 40-mile project area to provide an estimate of the overall mapping accuracy. During this process, the boundaries of approximately 54 aquatic vegetation beds were field corrected by an average of 65 feet (standard deviation [s.d.] 40 feet). The most common change was relocation of the deep edge of the beds closer to shore. In addition, four areas that had been mapped as aquatic vegetation beds were reclassified as unconsolidated river bottom in the field. A total of 895 aquatic vegetation bed polygons are shown on the habitat maps provided as Appendix C. The field verification process resulted in changes to 67 polygons or less than 8% of the mapped beds. A listing of all the map changes that were made based on groundtruthing of the aquatic vegetation beds is included in Appendix A.

In addition, the results of the groundtruthing transects were used to create error matrices to test for accuracy in photo interpretation and delineation of the aquatic vegetation beds and unconsolidated river bottom, following the procedures described by Congalton and Mead (1983). The matrix was completed using two separate approaches to bound the accuracy of the delineation maps (Table 4). In the first instance, an approach was taken that allowed no margin of error between the results shown on the delineation maps and the results from each groundtruthing stations in terms of habitat type and location. As noted above in Section 2.4.2, at several groundtruthing stations locations, small patches of aquatic vegetation were identified as shown on the maps. These small patches consisting of a few plants of a single species were not included in the delineated habitat boundary but were recorded for the groundtruthing station. Under the first approach, this would be recorded as an error in the matrix. The results of the error matrix indicated that the boundaries of the delineated habitats were identified with an accuracy rate of 72% (see Table 4). The second approach allowed a margin of error of +/- 25 feet between the delineated boundaries and

the groundtruthing station, in terms of habitat type and location. The results of the error matrix using the second approach indicated that the boundaries were delineated with an accuracy rate of 86% (see information in parentheses in Table 4). However, boundaries for several aquatic vegetation beds were modified as a result of spot-checking associated with the habitat assessments which has likely increased the overall mapping accuracy As stated in Section 2.4.2, the spot-checking locations for aquatic vegetation beds were selected based on uncertainty in the signature on the aerial photograph or because the current delineation conflicted with previous delineation information (e.g., Law, 1991). Because these locations were not selected randomly, completing an omission and commission matrix or determining accuracy by cover type was not possible.

For the wetland and shoreline habitats, as stated in subsection 2.4, many features were obscured by the riparian overhang and could not be identified from the aerial photographs. These features, which included linear aquatic vegetation beds, natural or maintained shorelines, and riverine fringing wetlands, were added to the maps during the field survey portion of the groundtruthing activities, and their locations were accurately recorded using reference landmarks and/or DGPS. Therefore, the location, type and extent of the unconsolidated river bottom, aquatic vegetation bed, shoreline, and riverine fringing wetlands habitats shown in Appendix C are based on interpretation of aerial photographs, spot-checking, detailed groundtruthing, and field delineation of the entire 40-mile project area.

Table 4 – Photointerpretation and Delineation Error Matrix

	Mapped as Aquatic Vegetation Bed	Mapped as Unconsolidated River Bottom	Total
Groundtruthing Showed Aquatic Vegetation	77 (91)	13 (3)	90 (94)
Groundtruthing Showed Unconsolidated River Bottom	36 (22)	49 (59)	85 (81)
Total	113	62	***175***

Notes:
1. The numbers outside the parentheses were determined using the first approach, with no margin of error, described in the text above. The numbers shown in parentheses were determined using the +/- 25 feet margin of error described in the text above.
2. The aquatic vegetation bed groundtruthing stations (a total of 175) were used to develop this error matrix. This number is shown in the bottom right cell of the table. The accuracy of the wetland and shoreline delineations was assessed using a separate approach as described above in the text.

3. The column headings relate to delineation maps shown in Appendix C. The row headings relate to the habitat type identified at the aquatic vegetation (SAV) groundtruthing stations shown on Figures 2-14 and listed in Appendix A. When the habitat types in the column and row are the same (e.g., mapped as aquatic vegetation and groundtruthed as aquatic vegetation), the delineation is considered "correct." When the habitat type in the column does not match the habitat type in the row (e.g., mapped as aquatic vegetation and groundtruthed as unconsolidated river bottom), the delineation is considered an "error."
4. To calculate the percent (%) accuracy, the total number of "correct" delineations is divided by the total number of groundtruthing stations. In Table 4, the values are added diagonally and divided by the total. For example, 77+49 = 126, and 126 divided by 175 = 0.72 (or 72%).

2.5 Step 4: Digitized Habitat Maps

Field verified habitat boundaries were digitized into CAD (AutoCAD® 2004). Digitized maps were exported as shape files for transfer into ArcView® for combining with the underlying 2003 digital orthophotographs to produce the final maps. These maps were printed at a scale of 1" = 200.' The prints were compared to the field verified boundaries and the aerial photographs to identify and correct inconsistencies and confirm that all visible habitat boundaries from the aerial photographs had been mapped.

In addition, subsequent to the initial preparation of these maps, during the development of the Phase 1 and Phase 2 designs, GE delineated (or will delineate) the boundaries of the riverine fringing wetlands within dredge areas in accordance with the USACE wetland delineation manual (USACE, 1987). The delineations of wetlands in Phase 1 areas, as well as in Phase 2 areas in River Section 1, have been completed, and these delineations have been included on the digitized maps. Delineations for the remaining Phase 2 wetlands will be provided in the appropriate Phase 2 design report component). In addition, if boundaries for other habitat types, particularly SAV, are modified during subsequent assessments, those modified boundaries also will be provided in the appropriate Phase 2 design report component. The digitized maps showing the distribution of unconsolidated river bottom, aquatic vegetation bed, shoreline, and riverine fringing wetland habitats throughout River Sections (RS)1, 2, and 3 are provided in Appendix C; these maps are also provided in electronic format on the DVD accompanying this report as both PDF files and GIS shapefiles The maps depict the most recent boundaries based on habitat assessments and wetland delineations completed since the initial 2003 habitat delineation and include information from 2003 through 2008 for River Section 1 and the landlocked portion of River Section 2 and information from 2003 through 2006 for lower River Section 2 and River Section 3. These maps also present the following specific information relating to these habitats:

- For the unconsolidated river bottom habitats, the maps show sediment types from the SSS surveys as well as sediment data gap probing data to differentiate areas within these habitats. In addition, the maps depict areas of submerged debris, as identified

from the SSS surveys; for these areas, the maps provide code numbers from the surveys (as designated by OSI) to identify the specific types of debris (Appendix E). Descriptions of the debris identified at each location may also be viewed electronically on the GIS shapefiles by selecting the feature of interest with the Identify tool.

Table 5 – Side- Scan Sonar Debris Class

Debris Class	Description
A	0 to 20 feet in length
B	20 to 40 feet in length
C	40 feet or greater in length
DA	Area of debris, the dimensions of which are provided in the Comments field

Note:
1. Appendix E provides the debris code and comments for all debris areas shown on the maps.

- For aquatic vegetation bed habitats, percent cover categories in 25% increments (e.g., 0 to 25%) are shown to indicate the type (i.e., dense, sparse) of aquatic bed (modified from Orth et al., 1991 and Steeves, 1999). In addition, areas dominated by water chestnut ("*Trapa*" in the legend) are identified separately, but no effort will be made to replace water chestnut beds in kind if they are impacted by remedial activities (BBL, 2003b). To facilitate the replacement of aquatic vegetation with non-invasive native species in targeted areas, appropriate goals and benchmarks are included in the USEPA-approved Phase 1 AM Plan (QEA, 2008) (which includes an Invasive Species Management Plan) and will be included in the *Phase 2 Adaptive Management Plan* (Phase 2 AM Plan). Although *Trapa* areas are identified separately, the locations of all stations at which any exotic species was observed during groundtruthing can be seen on the GIS shapefiles using the Identify tool. The differentiation of SAV into *Trapa* and non-*Trapa* SAV (i.e., generally wild celery dominated SAV beds) is consistent with the HDA Work Plan and with the SAV mapping that has been completed in the Lower Hudson River (Nieder et al., 2004). This level of detail is consistent with the HDA Work Plan, with previous aquatic vegetation mapping in the Upper Hudson (Law Environmental, 1991 and Exponent, 1998) and with the submerged aquatic vegetation mapping in the Lower Hudson River being conducted by the New York State Department of Environmental Conservation (NYSDEC) separate from GE's work in the Upper Hudson River. The different types of habitat are sometimes difficult to distinguish on the maps, especially with the sediment type layer backdrop. Note that the designs for the replacement and reconstruction of the aquatic vegetation beds have been (for Phase 1) and will be (for Phase 2) based on the physical conditions and species compositions of the non-*Trapa* (i.e., non-invasive native species) SAV areas that are recorded during habitat assessments (see Phase 1 AM Plan [QEA, 2008]). The plant

species included in the replacement/reconstruction designs have been and will be determined from data collected during the habitat assessments, with no exotic or invasive species included in the replacement reconstruction designs.

- For the shoreline habitats, natural and maintained shorelines are separately identified on the maps. In addition, code numbers are provided next to the shorelines to indicate the specific type of natural or maintained shoreline, the adjacent land use as determined from the aerial photographs, and the width of the riparian zone. Table 6 and the map legend define these codes. On the maps, the letter and number before the dash indicate the general type of shoreline (i.e., natural or maintained) and the specific subcategory of shoreline within those general categories, and the letter and number (Roman numeral) after the dash indicate the land use of the adjacent area and the width of the riparian zone (modified from Edinger et al., 2002). The modification from Edinger et al. (2002) includes the addition of a site-specific category that is not described by Edinger et al. (2002), specifically riprap shore with well-developed shrubs or trees. In areas of highly variable shoreline types, symbols are used on the shoreline and the associated codes are described for that symbol elsewhere on the maps where space allows.

- The locations of the backwater and riverine fringing wetlands are identified on the maps. As noted above, these include the wetland delineations that have been conducted to date, in accordance with the USACE wetland delineation manual (USACE, 1987), in Phase 1 areas and in Phase 2 areas in River Section 1.

- Aquatic vegetation bed, shoreline, and fringing wetland groundtruthing locations are also shown on the maps. The species identified at these locations may be viewed in Appendix A or electronically in the GIS shapefiles by selecting a specific location with the Identify tool.

- Locations of the SSAP surface sediment samples collected within the delineated habitats for analysis of total organic carbon (TOC) and percent fines (0- to 2-inch core intervals or 0- to 6-inch grab samples) are also provided on the maps.

Table 6 – Adjacent Land Use and Riparian Zone Width Codes

Shoreline Code	Description
N	Natural
M1	Riprap
M2	Bulkhead piling
M3	Concrete
M4	Riprap with Woody vegetation
Adjacent Land Use Code	
A	Cropland / Row Crops
B	Pastureland
C	Floodplain
D	Maple / Basswood Rich Mesic Forest
E	Emergent
F	Mowed Lawns with Trees
G	Development/Infrastructure
Width of Adjacent Land	
I	<50 feet
II	50 to 100 feet
III	100 to 200 feet
IV	>200 feet
V	<50 feet to adjacent road

2.6 Description of Existing Habitats

Each of the four observed habitats is briefly described below.

2.6.1 Unconsolidated River Bottom

Sediment type is the dominant feature of unconsolidated river bottom habitat. SSS surveys, performed as part of the SSAP to map the river bottom, classified the surficial sediments into the following five types (OSI, 2003a):

- Type I (clay, silt, fine sands): Smooth, generally featureless bottom; principally composed of soft aqueous silty sediments;
- Type II (sands): Smooth to mottled bottom; principally composed of semi-compact to compact sand deposits;
- Type III (coarse gravel and sand mixtures): Irregular bottom; principally composed of compact gravel and cobble deposits intermixed with sand;

- Type IV (mixed sediments): Smooth and irregular bottom; a varying assemblage of sediments typically associated with Types I, II, and III; and

- Type V (rocky): Extremely irregular bottom; principally composed of bedrock, cobbles, and/or boulders that are often overlain by a variable thickness of unconsolidated sediments.

Type IV sediments are the most common in River Section 1, with Type I sediments found in the shallower areas adjacent to the shoreline. The sediments in the navigational channel are predominantly Types II and IV. In most of River Section 2, the most common substrate is Type II, with Type I sediments found in the shallower areas adjacent to the shoreline. At the downstream end of River Section 2, Type 3 sediments are common in areas around the Route 4 Bridge, extending into River Section 3 near Schuylerville (below Lock 5). In River Section 3, Type II sediments are common in the top portion of River Section 3 from Schuylerville to Stillwater, intermixed with Types I and IV in shallower areas. Below the dam at Stillwater, the sediment type changes and is primarily Type III, with Type V also common.

Debris is ubiquitous throughout the project area and is comprised of logs, trees, boulders, relic cribs (i.e., roughly 100-square-foot structures made of submerged logs filled with rocks and boulders), and other, as yet, unidentified submerged objects (Appendix E). This debris provides topography, structure and localized habitat that is important to a variety of species. Debris in River Section 1 is common and occurs in long continuous areas along both sides of the river. High concentrations of debris are located in River Section 2 between Thompson and Galusha Islands. In the downstream portion of River Section 2, debris is common outside of the navigational channel and includes numerous relic cribs. In River Section 3, debris is common outside of the navigation channel. Unlike River Sections 1 and 2, there are large areas of River Section 3 with little or no areas of debris (e.g., river mile [RM] 154 to 157, RM 161 to 163 and RM 172 to 174). For Phase 1 areas, subsequent identification and engineering evaluation of the debris were presented in the Phase 1 FDR. For Phase 2 areas, identification and engineering evaluation of debris will be presented in the Phase 2 Final Design Report.

2.6.2 Aquatic Vegetation Beds

Aquatic vegetation beds are common features of the Upper Hudson River, particularly in the shallower areas along the shoreline and around islands, but also occur in mid- to cross-channel areas such as in the upper portions of the East and West Channels of Rogers Island. Aquatic vegetation beds vary in size from small isolated patches several square meters in size, to long linear beds that extend for hundreds of meters. In river meanders,

the beds generally extend further from the shoreline, in several locations they are nearly bank to bank.

Aquatic beds in River Section 1 are dominated by wild celery (*Vallisneria americana*). Several other species are commonly found intermixed with the wild celery, including common waterweed (*Elodea canadensis*), white water lily (*Nymphaea odorata*), and pondweeds (*Potamogeton* spp., *Najas* spp). The floating leaves of the latter species are easily visible on the aerial photographs. A large isolated bed of water chestnut is located on the west side of Griffin Island (GI) and was the only occurrence of exotic aquatic species observed in River Section 1 during the delineation and groundtruthing activities conducted as part of the habitat delineation described in this report. USEPA representatives indicated that they observed a small amount of the exotic species curly pondweed (*Potamogeton crispus*) in 2005 along the eastern side of the river above the Moses Kill.

In River Section 2, the aquatic vegetation beds are also dominated by wild celery, intermixed with various pondweeds common waterweed, and white water lily. The exotic species water chestnut and curly pondweed were also observed in this river section by USEPA representatives.

In River Section 3, the aquatic vegetation beds are dominated by wild celery, intermixed with pondweeds, common waterweed, white water lily, and Eurasian watermilfoil (*Myriophyllum spicatum*), an exotic aquatic species. Eurasian watermilfoil is common in the aquatic beds near Stillwater. Water chestnut is more prevalent in River Section 3, with large beds occurring in several locations. A large bed of water chestnut mixed with yellow floating heart (*Nymphoides peltata*), another exotic aquatic species, is found just north of Stillwater. Curly pondweed (*Potamogeton crispus*), an exotic species, was also found in River Section 3. Below Lock 2, the river is wider and straighter and aquatic vegetation beds are limited to nearshore areas.

Common species observed in the aquatic vegetation beds during the delineation and groundtruthing activities described in this report are listed in Appendix A (by groundtruthing station) and Appendix B (by river section). Appendix B also lists species observed by other parties.

During habitat assessments, GE is preserving specimens of less common or exotic species for submittal to a third party for identification. GE intends to submit the voucher specimens to the New York State Museum in 2008, and will provide a list of the plants with tentative species identification to EPA with the transmittal letter.

2.6.3 Shorelines

Maintained and natural shorelines occur in each river section, with natural (unhardened) shorelines comprising the majority of the river shoreline. Maintained shorelines are characterized by riprap, bulkhead piling, concrete, and/or mowed areas and were mainly found around bridge footings, roads, or locks, or adjacent to residential and agricultural areas. Rip-rap was the dominant form of shoreline stabilization in all river sections, although it was not the dominant shoreline feature. Natural shorelines are characterized by vegetation including canopy, shrub, and groundcover species. Forested areas occur commonly along all river sections and large trees frequently overhang the river providing shade and cover for fish and wildlife species. Common species observed in the canopy, shrub, and groundcover layers are listed in Appendix A (by groundtruthing station) and Appendix B (by river section).

In River Section 1, the longest contiguous length of maintained shoreline was associated with County Route 29 (River Road) along the west shore of the River and was predominantly rip-rap. Much of rip-rap was installed years ago, such that some of these areas now support soils and vegetative cover; these areas were mapped as “riprap with woody vegetation.” Along the east shore, rip-rap associated with Route 4 was present at very few locations; however, because residences are established on the land separating Route 4 from the Hudson River, mowed areas and docks are common along the banks in River Section 1. Natural shorelines were most common along the east shore of River Section 1, around Rogers and Griffin Islands, and at the mouths of tributaries.

Natural shorelines are common in River Section 2. In River Section 2 below the Thompson Island Dam and above Lock 6, houses are common along both sides of the river, but the shorelines are largely natural with only occasional docks and maintained areas. Below Lock 6, steep banks are prevalent along the western shore and forested areas along the eastern shores. Nearer the Northumberland Dam, the west shore is dominated by maintained rip-rap associated with County Route 29 (River Road).

Large agricultural areas are common along both shores of River Section 3, but these areas are often separated from the river by a narrow band of trees or (less commonly) an adjacent road. Houses are also common in River Section 3, often at higher densities than those found in River Sections 1 and 2, particularly near towns (e.g., Stillwater and Mechanicsville) and below Lock 2. Maintained shoreline consisting of docks, piers, and mowed lawns are common in these residential areas. Natural shorelines with large forested areas are less common below Lock 2.

2.6.4 Riverine Fringing Wetlands

Riverine fringing wetlands in the Phase 1 and Phase 2 areas (target and reference) of the Upper Hudson River range in size from less than one-tenth of an acre to 5.65 acres, but are predominantly small (less than 2,023 m^2 [0.5 acre] in size), dynamic systems that lie within the river banks at normal pool elevations. Riverine fringing wetlands are common along river meanders and behind islands. These wetlands generally support distinct emergent vegetation communities. The riverine edge of the fringing wetlands is dominated by broadleaved emergent species such as pickerelweed (*Pontederia cordata*) and arrowhead (*Sagittaria latifolia*). Wild rice (*Zizania aquatica*) and SAV (e.g., wild celery) are commonly found along the riverine edge of the wetlands. The middle portions of the wetlands are dominated by great burreed (*Sparganium eurycarpum*) and occasionally rice cutgrass (*Leersia oryzoides*). Along the upland edge of the wetlands, reed canary grass (*Pharlaris arundinacea*) and/or cattail (*Typha latifolia*) are common. Riverine fringing wetlands in River Section 1 contain a variety of species; these include cattails, although cattails were not present in the areas groundtruthed or in quadrats sampled during assessment. In River Section 2, riverine fringing wetlands included a variety of species, including cattails found along the upland edge of larger fringing wetlands. In the upper portion of River Section 3, dense stands of cattail are the dominant feature in these fringing wetlands. Riverine fringing wetlands, in general, are less common in the downstream portions of River Section 3; however this section supports many narrow linear bands of wild rice. Common wetland species observed during groundtruthing are listed in Appendix A (by groundtruthing station) and Appendix B (by river section).

3. Reference Areas

The HDA Work Plan provided that, "to judge the success of the habitat replacement and reconstruction program after its implementation, given the changes in river hydrology, bathymetry, and geomorphology that may occur in the meantime (both from the dredging and from other, unrelated factors), areas within the Upper Hudson River that are not directly impacted by the dredging will be used as reference areas" (BBL, 2003b, p. 1-4). That statement was repeated in the Operation, Maintenance, and Monitoring Scope (OM&M Scope) on which USEPA and GE agreed as part of the Consent Decree for the Upper Hudson River (USEPA and GE, 2005, Attachment E to Appendix B, p. 4-7). The OM&M Scope further explained that, for purposes of evaluating success, "data from reference areas will include not only measurements in the specific non-dredge areas selected as post-remediation reference areas, but also data from on-site target and reference areas prior to remediation" (USEPA and GE, 2005, Attachment E to Appendix B, p. 4-8). (These data are referred to collectively as the "reference condition.")

Section 3.1 of this report discusses the "on-site" reference areas located within River Sections 1, 2, and 3 (the project area). These reference areas have been approved by USEPA. Consistent with the above-cited documents, data from these areas, both before and after dredging (if such areas are not impacted by the remedial activities), will be considered for use as part of the reference condition in the evaluations of habitat replacement/reconstruction success. In accordance with the OM&M Scope (pp. 4-9, 4-12), the Phase 1 AM Plan includes the general narrative success criterion, as well as general discussions of quantitative success criteria and hypotheses. Quantitative success criteria for Phase 1 areas will be set forth in the *Operation, Maintenance, and Monitoring Plan for Phase 1 Caps and Habitat Replacement/ Reconstruction* (Phase 1 Cap/Habitat OM&M Plan). As stated in the OM&M Scope (p. 4-12), "[s]pecific numerical criteria will be developed when post-remediation monitoring is initiated, to account for contemporaneous conditions in the reference areas as well as pre-remediation conditions throughout each river section."

In addition, changes in conditions at a watershed or regional scale could affect local habitats. As a result, as described in the HDA Work Plan and the OM&M Scope, "off-site" reference areas located in the Hudson River upstream of the project area (referred to as the "Upstream Upper Hudson River") and in the Lower Mohawk River, with river features that are reasonably similar to those found within the project area, were also evaluated for potential utility as reference areas. These areas are discussed in Section 3.2. These "off-site" reference areas will be used to evaluate the impacts (if any) of broad, watershed-wide or regional changes unrelated to the remediation project that may extend beyond the

project area – e.g., the impact of such changes on differences between pre-dredging and post-dredging conditions at target and/or reference areas.

3.1 On-Site Reference Areas

The HDA Work Plan specified that, in total, assessments would be completed at 136 unconsolidated river bottom, 52 aquatic vegetation bed, 68 shoreline, and 10 fringing wetland habitat stations. Based on subsequent field work, the number of riverine fringing wetland stations was increased to 24 to include some areas identified by state and federal resource agencies as especially sensitive or unique habitats (ESUH) and all wetlands identified in the Phase 1 area to represent a greater variety of wetlands. In addition, riverine fringing wetland stations greater than 0.5 acre (only present in Phase 2 areas) and aquatic vegetation beds greater than 3 acres were sampled at two locations within each station in 2006 to evaluate variability within wetlands/aquatic vegetation beds (BBL and Exponent, 2005b). Therefore, the number of unconsolidated river bottom stations was reduced to 100 stations to compensate for the greater number of riverine fringing wetland and aquatic vegetation bed stations. The assessments for each habitat type follow a balanced design – i.e., 50% of the total stations are to be areas that may potentially be impacted by dredging (target stations), and the remaining 50% of the stations are to be in reference locations outside of dredge areas and are not impacted by remedial activities (reference or nondredged stations).

The target and reference stations for both Phase 1 and Phase 2 areas were identified in the *Supplemental Habitat Assessment Work Plan* (SHAWP; BBL and Exponent, 2005b), which was approved by USEPA in November 2005, with the Phase 2 target and reference stations subject to change following approval of the Phase 2 DAD Report (which occurred in November 2007). By the end of 2005, assessment activities had been conducted in all Phase 1 dredge areas and the associated reference areas and in a subset of the Phase 2 dredge areas and associated reference areas. In 2006 assessment activities were conducted in the remaining Phase 2 dredge areas and associated on-site reference areas, as well as off-site reference locations. In 2007, reassessment activities were conducted in certain Phase 1 areas and associated on-site reference areas.

3.2 Off-Site Reference Areas

Two steps were used to evaluate whether off-site reference areas in the Upstream Upper Hudson and Lower Mohawk Rivers were suitable for use in the habitat replacement and reconstruction program. Step 1 involved reviewing existing information to identify candidate

reference areas for further evaluation, and Step 2 involved further evaluating those candidate areas through field reconnaissance. These steps are described below.

3.2.1 Step 1: Review of Existing Information

Pursuant to the HDA Work Plan, identifying off-site "candidate reference areas" in the Upstream Upper Hudson and Lower Mohawk Rivers began with a comparison of physical habitat conditions in these areas with the range of habitat conditions in proposed dredged areas. The first step in this process involved using existing information to evaluate each of the following physical features of candidate reference areas in relationship to physical features in the project area:

- Gradient (from topographic maps);
- Fetch (from topographic maps);
- Adjacent land use (from aerial photography); and
- General geomorphic riverine features (width, sinuosity).

Aerial photographs, topographic charts, and road maps were used as sources of information for reviewing physical features in the Upstream Upper Hudson and Lower Mohawk Rivers. It was difficult to identify a specific reach for an off-site reference area in either of these two systems, because one or more physical features were usually not comparable to physical features of the project area. For example, although the gradient in areas of the Upstream Upper Hudson and Lower Mohawk Rivers is reasonably similar to that in the project area, each of these river areas is separated by locks and dams that result in a series of pools of varying size, fetch (e.g., distance of open water that wind blows over) and sinuosity so that gradient may not be a significant factor in determining the type and distribution of habitats. In addition, adjacent land use varies considerably within these river systems (Table 7, below).

Table 7 – Comparison of Physical Features in Potential Reference Locations

River Section	Fetch	Adjacent Land Use	Width (m)	Sinuosity
Upper Hudson River – Project Area				
River Section 1	Predominantly North to South	Light residential /undeveloped	150 – 300	Low
River Section 2	Predominantly North to South	Light residential /undeveloped	150 – 400	Low
River Section 3	Predominantly North to South	Light residential /undeveloped	150 – 300	Low
Upstream Upper Hudson River				
Sherman Island Hydroelectric to West City Limits of Glens Falls	Varies: North to South; East to West	Moderate residential / undeveloped	200 – 400	High
West to East City Limit of Glens Falls	Varies: North to South; East to West	City of Glens Falls	200 – 300	Moderate
East City Limit Glens Falls to North City Limit Fort Edward	Varies: North to South; East to West	Village of Hudson Falls / Undeveloped	75 – 300	Moderate
Lower Mohawk River				
Lock 8 to Lock 7	Varies: East to West; Northwest to Southeast	Light residential / City of Schenectady	100 – 300	Moderate
Lock 7 Boat Launch to Route 9	Varies: East to West; Northwest to Southeast; Southwest to Northeast	Light residential / Undeveloped	150 – 800	Moderate
Route 9 to Confluence with Hudson River (Cohoes)	Northwest to Southeast	City of Cohoes; Town of Waterford	200 - 800	Low

In addition to evaluating physical features, the specific locations of potential reference habitats were identified, because a candidate reference area could exhibit suitable physical features but lack habitat. Aquatic bed, wetland, and shoreline habitats were readily discerned from, and marked on, aerial photographs. Unconsolidated river bottoms, by definition, were identified as those areas that were not identified as aquatic vegetation beds.

Based on the results of the initial assessment of physical features and preliminary locations of habitat types, two of the potential off-site reference areas listed above were selected for further field evaluation. These candidate off-site reference areas are:

- *Upstream Upper Hudson River:* Sherman Island Hydroelectric Plant to West City Limits of Glens Falls; and

- *Lower Mohawk River:* Lock 7 to Route 9 Marina near Town of Colonie Landfill.

The primary reason for selecting these two areas for further evaluation is that they appeared, based on the preliminary review of existing information, to have a range of physical habitat conditions that could fall within the range determined for habitats in the project area. The other potential off-site reference areas listed in Table 7 were not selected for further evaluation because most other reaches of the Upstream Upper Hudson and Lower Mohawk Rivers are bordered by cities and towns, or have navigation hazards within the main channel (e.g., Cohoes Falls). These conditions are not similar to conditions in the project area where habitats have been and will be assessed.

3.2.2 Step 2: Field Reconnaissance

As stated in the HDA Work Plan (BBL, 2003b), the purpose of field reconnaissance of candidate off-site reference areas was not to "exhaustively delineate or assess candidate reference areas; rather, it was to identify and document whether habitats similar to those in the project area are found upriver or on the Lower Mohawk River." The field reconnaissance was completed in early October 2003. The lateness of the season prevented positive identification of some species (though not genera), but sufficient vegetation was present to complete the reconnaissance. Consistent with this objective, the two candidate areas selected for further evaluation were surveyed via field reconnaissance. This reconnaissance was conducted from a jon boat, in a similar manner to the field verification work performed in the project area, and included an evaluation of a separate suite of physical habitat parameters for each habitat type (i.e., unconsolidated river bottom, aquatic vegetation bed, shoreline, and riverine fringing wetland) to determine the appropriateness of the candidate area as a reference location. The survey methods used to evaluate these habitat types are described in subsection 2.2.1.1 (pp. 2-15 to 2-16) of the HDA Work Plan. The specific locations at which the boat stopped to conduct such evaluations are listed, by geographic coordinates, in Appendix D. The following subsections provide the results of observations on unconsolidated river bottom, aquatic vegetation bed, shoreline, and riverine fringing wetland habitats in the two candidate reference areas in the Upstream Upper Hudson and Lower Mohawk Rivers.

3.2.2.1 Upstream Upper Hudson River

A reconnaissance of the Upstream Upper Hudson River above the City of Glens Falls was conducted on October 7, 2003, to evaluate its potential for use as an off-site reference area. The reconnaissance was completed by boat and followed the field survey methods described in the HDA Work Plan for groundtruthing the four habitat types.

On the Upstream Upper Hudson River, the field survey was conducted between the Sherman Island Hydroelectric Plant and the confluence of the river with the feeder canal starting near Towpath Lane. The total length of river surveyed in this area was approximately 10 kilometers (6 miles). To avoid the possible influence of point sources on habitat conditions, no surveys were conducted in areas of the river that were adjacent to the City of Glens Falls. Aquatic bed habitats were dominated by a burreed species, most likely *Sparganium fluctuans* or *S. angustifolium* (reproductive structures were not present and positive identification was therefore not possible). The submerged leaves of the burreed are similar in structure to wild celery, which is the dominant submerged aquatic plant in the project area. However, wild celery was not observed during the reconnaissance of this candidate reference area. It was visually estimated that the burreed covered nearly 90% of the river bottom habitat, and at times this species was mixed with several different pondweeds (*Potamogeton* spp). Due to these differences, measurements were taken at only one aquatic vegetation bed location. For the wetlands, in addition to burreed, other dominant species included spike rushes (*Eleocharis* spp.), arrowhead (*Sagittaria latifolia*) and bulrushes (*Scirpus* spp.). At a residential community north of Nolan Road, seepage from drainage pipes along a highly sloped bank was noted as a potential point source to the river. Table 8 shows the results of the reconnaissance for wetland and aquatic vegetation bed habitats.

Table 8 – Riverine Fringing Wetland and Aquatic Vegetation Bed Habitat Characteristics in the Upstream Upper Hudson River

Habitat Type	Northing (unitless)	Easting (unitless)	Water Depth (cm)	Habitat Size (m_2)	Point Sources (unitless)	Dominant Species (% dominance)	Cover ~(%)
Riverine Fringing Wetland	1622055	709718	0	10,000	None	*Spike Rush (90%)*	-
	1623309	707259	0	> 10,000	None	*Burreed (70), Arrowhead (20%)*	-
	1623458	711362	0	< 10,000	None	*Bulrush (80%)*	-
	1618547	715656	0	< 10,000	a	*Burreed (60%), Bulrush (30%)*	-
Aquatic Vegetation Bed	1621530	709088	123	> 10,000	NA	*Burreed*	90

Notes:
1. cm = centimeters
2. NA = Not applicable
3. a = minor runoff from residential area
4. Dominant species were determined by visual observations of percent cover

The substrate composition for unconsolidated river bottom and shoreline habitats was consistently sand with silt and clay (Table 9). Sloped banks along the river were generally sandy and well stabilized (< 5% erosion) by established canopy, shrub, or groundcover plants, or as noted in many locations, crushed gravel. Very little erosion resulting from wave action or flow was observed along the shoreline. In general, the majority of unconsolidated river bottom and shoreline habitats in the Upstream Upper Hudson River are physically different from these same habitats in the areas assessed to date in the Upper Hudson River. A limited number of stations were available within these habitats in the Upstream Upper Hudson River where these differences were negligible and assessments could be completed.

Table 9 – Unconsolidated River Bottom and Shoreline Vegetation Habitat Characteristics in the Upstream Upper Hudson River

Habitat Type	Northing (unitless)	Easting (unitless)	Water Depth (cm)	Substrate Composition (%) [a]	Point Sources (unitless)	Bank Stability (% erosion)[b]	Vegetation Cover (%)[c]	Riparian Edge (m)
Unconsolidated River Bottom	1620906	706411	109	80% sand 20% silt	None	NA	NA	NA
Shoreline	1615290	712728	NA	90% sand 10% silt	None	< 5%	80/80/60	> field of view
	1622913	706411	NA	70% sand 10% silt 20% clay	None	< 5%	30/40/90	> field of view

Notes:
1. [a] = substrate compositions are based on textural assessment conducted in the field
2. [b] = less than 5% erosion = stable; 5%-30% = moderately unstable; 30%-60% = moderately unstable; 60%-100% = unstable (Barbour et al., 1999)
3. [c] = percent covers reported as canopy/understory/groundcover. For example, <10/90/20 = <10% canopy/90% understory/20%groundcover

3.2.2.2 Lower Mohawk River

A reconnaissance of approximately 14.5 kilometers (9 miles) of the Lower Mohawk River between Lock 7 and the Route 9 Marina near the Town of Colonie landfill was conducted by boat on October 8, 2003, to evaluate a portion of that river as a potential off-site reference area. Field reconnaissance methods followed those described in the HDA Work Plan.

Riverine fringing wetlands along the Lower Mohawk River are composed of several common emergent vegetation species of the northeast. The major communities within the riverine fringing wetlands are dense stands of pickerel weed (*Pontederia cordata*), arrowhead (*Sagittaria* spp.), and non-native purple loosestrife (*Lythrum salicaria*) that transition upland into extensive stands of the non-native common reed (*Phragmites communis*). These conditions are not comparable to those in the riverine fringing wetlands in the Phase 1 project area, although some species such as *Pontederia* and *Sagittaria* are common to both the Lower Mohawk River and River Sections 2 and 3. Only one fringing wetland in the Lower Mohawk River contained a relatively small stand of cattail (*Typha latifolia*) mixed with common reed (Table 9). Because cattail is present in the riverine fringing wetlands of the Upper Hudson River project area, this wetland was evaluated as a potential reference habitat during the reconnaissance. Within the river itself, dense mats of water chestnut were common throughout the Lower Mohawk River, including locations immediately offshore of riverine fringing wetland habitats. In addition to water chestnut, other species (wild celery, pondweeds, and Eurasian watermilfoil were common in aquatic vegetation beds (Table 10). In the area surveyed, aquatic vegetation beds cover a large portion of the shallower waters of the river and were co-dominated by Eurasian watermilfoil

and wild celery. Pondweeds were present in many beds, but were not as common as in project area. Several of these beds were sampled (Table 9), as they were observed to have similar species composition and percent cover compared to aquatic vegetation beds in River Section 3 of the project area. Average shoot length of wild celery in these beds was 92.8 cm (44.9 cm s.d.). Average shoot length of wild celery in the Upper Hudson River varied from 59.1 cm (21.4 cm s.d.) at Station 8 to 126.9 cm (31.5 cm s.d.) at Station 1.

Table 10 – Riverine Fringing Wetland and Aquatic Vegetation Bed Habitat Characteristics in the Lower Mohawk River

Habitat Type	Northing (unitless)	Easting (unitless)	Water Depth (cm)	Habitat Size (m_2)	Point Sources (unitless)	Dominant Species (% dominance)	Cover ~(%)
Riverine Fringing Wetland	1442457	684823	0	< 10,000	None	*Cattail (50%), Common reed (40%)*	-
Aquatic Vegetation Bed	1453471	701579	137	> 10,000	None	*Wild celery (60%), Eurasian watermilfoil (20%), Water chestnut (20%)*	80
	1442333	689924	197	< 10,000	None	*Wild celery (90%), Eurasian watermilfoil (10%)*	50
	1441201	688873	79	< 10,000	None	*Wild celery (50%), Pondweeds (50%)*	70
	1439055	680215	55	> 10,000	None	*Wild celery (60%), Pondweeds (30%), Water chestnut (10%)*	70
	1445091	669612	82	< 10,000	NA	*Wild celery (70%), Eurasian watermilfoil (30%)*	50
	1441524	671980	76	> 10,000	None	*Wild celery (70%), Eurasian watermilfoil (30%)*	40
	1447683	694985	146	> 10,000	None	*Wild celery (60%), Eurasian watermilfoil (40%)*	70

The substrate composition for unconsolidated river bottom habitats in the Lower Mohawk River was predominantly silt with smaller amounts of sand and clay mix, or at some locations, predominantly sand and cobble (Table 11). There was no evidence of point sources along the shoreline. The river banks were generally stable (< 5% erosion) and exhibited a range of substrate types (Table 10) and terrestrial vegetation.

Table 11 – Unconsolidated River Bottom and Shoreline Vegetation Habitat Characteristics in the Lower Mohawk River

Habitat Type	Northing (unitless)	Easting (unitless)	Water Depth (cm)	Substrate Composition (%) [a]	Point Sources (unitless)	Bank Stability (% erosion)[b]	Vegetation Cover (%)[c]	Riparian Edge (m)
Unconsolidated River Bottom	1446058	692585	163	20% sand 70% silt 10% clay	None	NA	NA	NA
	1444991	669528	263	100% cobble	None	NA	NA	NA
	1437886	677716	192	10% sand 60% silt 30% clay	None	NA	NA	NA
	1447741	694980	261	Trace sand 90% silt 10% clay	None	NA	NA	NA
	1452750	697132	300	50% sand 50% cobble	None	NA	NA	NA
Shoreline	1440647	673089	NA	100% shale	None	< 5%	< 10/90/20	> field of view
	1440655	673068	NA	10% sand 90% inorganic	None	< 5%	70/40/80	20
	1443942	669346	NA	10% sand 90% cobble	None	< 5%	60/40/70	20: agriculture
	1442457	684823	NA	90% sand 10% silt Trace boulder	None	10%	30/30/90	20: field
	1442539	685964	NA	100% sand Trace silt	None	< 5%	80/10/100	20: field

Notes:
1. [a] = substrate compositions are based on textural assessment conducted in the field
2. [b] = less than 5% erosion = stable; 5%-30% = moderately unstable; 30%-60% = moderately unstable; 60%-100% = unstable (Barbour et. al., 1999)
3. [c] = percent covers reported as canopy/understory/groundcover. For example, <10/90/20 = <10% canopy/90% understory/20%groundcover

3.2.3 Preliminary Evaluation of Off-Site Reference Areas

Suitable off-site reference areas should have similar habitat qualities (e.g., similar plant communities, adjacent land use, etc.) as those within the area of study. However, even if off-site reference area habitats have some differences from study area habitats, such reference areas can potentially provide information on watershed-wide or regional events that may influence the habitat replacement and reconstruction efforts in the project area. The unconsolidated river bottom and shoreline habitats that were assessed in the Lower Mohawk River are generally similar to those habitats in the Phase 1 and Phase 2 areas sampled to date in the Upper Hudson River. The mix of substrate types (e.g., sand, silt, and cobble) is within the range of substrate composition observed in the Phase 1 and Phase 2

areas sampled to date, and the shoreline is not as extensively stabilized by crushed gravel as was found in the Upstream Upper Hudson River. Furthermore, shoreline features in the candidate reference areas of the Lower Mohawk River have, at some locations, similar bank stability, vegetation cover, and riparian edge widths compared to shorelines in the Phase 1 and Phase 2 areas sampled to date.

On the other hand, the riverine fringing wetland and aquatic vegetation bed habitats of the Upstream Upper Hudson and Lower Mohawk River differ from those of the Upper Hudson River project area in two important ways as discussed below.

1. *Plant composition and community structure*. As discussed further in the Phase 1 HA Report, the riverine fringing wetlands in the Phase 1 and Phase 2 areas sampled to date are largely dominated (based on biomass and percent cover) by burreed, arrowhead, pickerelweed and cattail, but also contain several other distinct vegetation strata. Specifically, based on stem density, wild rice, millet, rice cutgrass, and reed canary grass are dominant vegetation strata, and the percent cover of the wetland provided by wild rice and millet is often greater than 30%. The riverine fringing wetlands in the Upstream Upper Hudson River candidate reference locations are also dominated by burreed but do not contain some of the other vegetation strata observed in the Phase 1 and Phase 2 areas sampled to date. Specifically, the strata dominated by pickerelweed and arrowhead were not present in the Upstream Upper Hudson River. The riverine fringing wetlands in the Lower Mohawk River are either dominated by or bordered by common reed, as was the case in the cattail wetland that was evaluated. The abundance of common reed in or adjacent to wetlands of the Lower Mohawk River differs from the plant species composition present in the wetlands of the Phase 1 and Phase 2 areas sampled to date. However, based on the results of the groundtruthing, the wetlands in River Section 3 of the Upper Hudson may have more similar species composition to the wetlands of the Lower Mohawk (e.g., cattail is present in both areas).

   The aquatic vegetation beds in the Phase 1 and Phase 2 areas sampled to date are dominated by wild celery. Other species including pondweeds and common waterweed, sometimes co-occur with the wild celery. In contrast, no wild celery was observed in the Upstream Upper Hudson River off-site reference areas during the initial groundtruthing, although it was subsequently collected during assessments (see Section 3.2.4). In the Lower Mohawk River, both wild celery and Eurasian watermilfoil co-dominate the aquatic vegetation beds. In addition, water chestnut is much more widespread in the Lower Mohawk River than in the Phase 1 and Phase 2 areas sampled to date, which include only one distinct location (behind Griffin Island) in River Section 1, although this

species is present at numerous locations throughout River Section 3. The percent cover of aquatic vegetation beds in the Upstream Upper Hudson and Lower Mohawk was similar to those found in the project area.

2. *Fetch.* The Upper Hudson River in the project area flows predominantly from north to south with only small meanders in the river. These conditions favor exposure of habitats to winds and wave action from northerly or southerly directions. Conditions in the candidate off-site reference areas are different. Specifically, fetch in the Lower Mohawk River is predominantly from west to east, and the north-south fetch in the Upstream Upper Hudson River (above Hudson Falls) is shorter than that in the project area due to the meander pattern of the river. Thus, habitats in the candidate reference areas are more exposed to sustained winds from the west or east, and are generally more sheltered from sustained winds from the north or south. These differences in physical conditions resulting from winds and wave action may influence the presence/absence, composition, or structure of the habitats.

Despite these differences, as stated previously, the off-site reference areas surveyed in the Upstream Upper Hudson and Lower Mohawk Rivers can potentially provide information on watershed-wide or regional events that may influence the habitat replacement and reconstruction efforts in the project area. Accordingly, in response to USEPA's recommendation, GE, in consultation with USEPA, selected two off-site reference stations for each habitat type in both the Upstream Upper Hudson (Sherman Island hydroelectric plant to west City limits of Glens Fall) and Lower Mohawk River (Lock 7 to Route 9 Marina). Those stations are described in Section 3.2.4. These off-site reference stations will be used to monitor changes in conditions at a watershed or regional scale that could affect local habitat within the project area, recognizing the above-mentioned differences between the aquatic vegetation bed and riverine fringing wetland habitats in the off-site areas and those in the project area. Thus, data from these off-site reference stations may be useful for explaining certain changes (e.g., decrease in aboveground biomass for all species or at all stations) observed at the on-site target and reference stations, but will not be used for direct comparison with target stations in the same manner as the on-site reference stations for determination of success.

3.2.4 Assessments of Off-Site Reference Stations

The specific locations for the off-site reference stations within the above-mentioned sections of the Upstream Upper Hudson and Lower Mohawk River were tentatively identified in the SHAWP, and final locations were selected in August 2006 based on a field reconnaissance conducted with USEPA oversight personnel. The aquatic vegetation bed, shoreline and

riverine fringing wetland assessment stations were selected if they contained species similar to those found on the Upper Hudson River sites, and if they appeared in relatively good condition (i.e., areas dominated by invasive species, contained large amounts of dead plant material or had accumulated trash/debris were avoided). Unconsolidated river bottom stations were selected within unvegetated areas with similar depth to those stations sampled on the Upper Hudson River. The locations for the off-site reference stations are shown in Figures 16 and 17. Habitat assessments were conducted at these stations in August 2006. The results from the habitat assessments are summarized below. Further details and data for the off-site reference stations are provided in the Phase 2 HA Report.

3.2.4.1 Upstream Upper Hudson

Off-site reference stations in the Upstream Upper Hudson were sampled between August 2 and August 22, 2006. There were two such stations in this area for each habitat type as shown on Figure 16 and summarized below.

Unconsolidated River Bottom

The substrate at UCB-UH-01 consisted primarily of cobble and gravel, with some boulders present and sand. There was no silt, detritus or other debris present. Conversely, the substrate at station UCB-UH-2 was predominately sand and silts. The area in and around station UCB-UH-2 was covered by the remnants of logs (some still nearly intact) that likely accumulated in the area when logging was still common.

Aquatic Vegetation Beds

SAV-UH-01 is a mixed species bed dominated by water bulrush (*Scirpus subterminalis*) and wild celery (*Vallisneria americana*), intermixed with muskgrass (*Chara* spp.). SAV-UH-02 is also a mixed species bed dominated by wild celery and water bulrush, intermixed with coontail (*Ceratophyllum demersum*). Water flow in the Upstream Upper Hudson was relatively low compared to flows in River Section 1 of the Upper Hudson during the same period and water clarity was good.

Natural Shorelines

The canopy layer at SHO-UH-01 was dominated by red oak (*Quercus rubra*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), and white pine (*Pinus strobus*). The understory was dominated by meadowsweet (*Spirea latifolia*), arrow-wood (*Viburnum dentatum*) and gray-stemmed dogwood (*Cornus racemosa*). Royal fern (*Osmunda regalis*),

cardinal flower (*Lobelia cardinalis*) and golden rods (*Solidago* spp.) were common in the herbaceous layer. At SHO-UH-02, the canopy was dominated by red oak, red maple, green ash (*Fraxinus pennsylvanica*) and white pine. The understory and herbaceous layers were similar to those found at SHO-UH-1.

Riverine Fringing Wetlands

WET-UH-01 was a relatively large flat wetland near the delta of a small unnamed tributary to the Upstream Upper Hudson. The emergent portion of the wetland was dominated by pickerel weed (*Pontederia cordata*), arrow-arum (*Peltandra virginica*) and sedges (*Carex* spp). WET-UH-02 was small wetland located on the outer edge of a small island. WET-UH-02 was also dominated by pickerel weed, arrow-arum and sedges.

3.2.4.2 Lower Mohawk River

Off-site reference stations in the Lower Mohawk River were sampled between August 1 and August 11, 2006. There were two such stations in this area for each habitat type as shown on Figures 17 and summarized below.

Unconsolidated River Bottom

The substrate at UCB-MO-01 consisted primarily of cobble and gravel, with some sand. There was a trace of detritus present at all locations. Live mussels and mussel shells were also present (10-20 percent). The substrate at UCB-MO-02 was primarily sand with some silt. There was a trace of detritus at most locations and no mussels (live or dead) were present.

Aquatic Vegetation Beds

The beds in the Lower Mohawk River were generally in very shallow water (often less than 0.5 meters deep) which precluded collection of light attenuation data. In general, water clarity in the Lower Mohawk was lower than that observed in the Upper Hudson River during 2006. Both aquatic vegetation beds sampled were dominated by wild celery. Water milfoil (*Myriophyllum spicatum*) and water chestnut (*Trapa natans*) were present at both stations but were not within the sampling quadrats. Water chestnut formed large dense beds along the southern shoreline of the river.

Natural Shorelines

The canopy at SHO-MO-01 was dominated by box elder (*Acer negundo*), Eastern cottonwood (*Populus deltoides*), green ash and silver maple. The understory was dominated by gray-stemmed dogwood, speckled alder and common buckthorn (*Rhamnus cathartica*). The herbaceous layer was dominated by golden rods and purple loosestrife (*Lythrum salicaria*). The canopy at SHO-MO-02 was dominated by Eastern cottonwood and box elder. The understory was similar to that at SHO-MO-01. The herbaceous layer was dominated by common reed (*Phragmites australis*) and hedge false bindweed (*Calystegia sepium*).

Riverine Fringing Wetlands

WET-MO-1 was located on the riverine edge of a large Phragmites marsh. The riverine edge was dominated by cattail (most likely *Typha x glauca*) and arrowhead (*Sagittaria latifolia*) and appeared similar to the riverine fringing wetlands found in the Upper Hudson. WET-MO-2 was a small pocket wetland dominated by arrowhead and purple loosestrife.

4. FCI Models

The derivation and potential use of alternatives to the FCI models are currently under discussion with USEPA as described in Exhibit A of the Phase 1 AM Plan (QEA, 2008). Due to these ongoing discussions, FCI models are not included in this report at the present time.

5. HSI Models

HSI models and/or other models will be used, if necessary, as a supplement to other measures for evaluating habitat replacement and reconstruction success, to quantify the fish and wildlife habitat functions for representative indicator species. HSI models exist for 157 species, many of which are not found or are uncommon in the Upper Hudson River (Edinger et al., 2002). Of these fish and wildlife species, some are predominantly terrestrial or are observed infrequently on the river. White-tailed deer, wild turkey, gray squirrel, and fisher are examples of terrestrial species that were removed from further consideration. Representative fish species were selected based on functional groups and/or association with habitats that could be potentially impacted by remediation. The resulting refined list of species for which HSI models were reviewed is shown in Table 12, below. The results of the review, indicating whether the species was retained for calculation of an HSI model, are shown in that table.

Table 12 – List of Potential Species for HSI Models

Species (Scientific Name)	Associated Habitat	Retained (Yes/No)	Rationale
Birds			
Belted Kingfisher (*Ceryle alcyon*)	SHO, UCB	Yes	• Habitat potentially impacted by dredging • Forested habitat along edge of the river provides foraging and nesting • River likely provides suitable prey population
Great Blue Heron (*Ardea herodius*)	SHO, UCB, WET, SAV	Yes	• Habitat within range of nesting sites • River likely provides suitable prey population • HSI model for Upper Hudson River will only use the foraging index within the overall HSI
American Black Duck (*Anas rubripes*)	SHO, UCB, WET	No	• NY is not in wintering range on which model is dependent
Bald Eagle (*Haliaeetus leucocephalus*)	SHO, UCB, WET, SAV	No	• Species being addressed through a separate assessment of threatened and endangered species
Lesser Scaup (*Athya affinis*)	SHO, UCB, WET	No	• HSI model for wintering range applicable only to Gulf of Mexico and southern Atlantic coast • HSI model for the breeding range applicable to the Rocky Mountain area
Great Egret (*Ardea alba*)	SHO, UCB, WET, SAV	No	• HSI applicable only to Atlantic coast, inland Southeastern United States, Texas, and Louisiana coastal wetlands
Pileated Woodpecker (*Dryocopus pileatus*)	SHO	No	• HSI is only applicable to terrestrial and forested wetland habitats that are unlikely to be impacted remedial activities
Wood Duck (*Aix sponsa*)	SHO, UCB, WET, SAV	Yes	• Forested wetlands along river provide potential nesting sites • Overhang and downfall along natural shorelines provide potential cover

Species (Scientific Name)	Associated Habitat	Retained (Yes/No)	Rationale
Mammals			
Beaver (*Castor canadensis*)	SHO, WET, SAV	No	• Close proximity of roadways inconsistent with HSI requirements
Mink (*Mustela vison*)	SHO, WET	Yes	• Portions of potential mink habitat in near-shore areas could be impacted by remedial activities; therefore mink has been retained as requested by the USEPA.
Muskrat (*Ondatra zibethicus*)	SHO, WET, SAV	Yes	• Abundant herbaceous vegetation on shoreline and in wetlands • Low flow conditions of Upper Hudson River still provide surface water • Tracks frequently observed during assessment of fringing wetlands
Fish			
Yellow Perch (*Perca flavescens*)	UCB, SAV	Yes	• Habitat potentially impacted by dredging • Recreational species • Predator/invertivore
Largemouth Bass (*Micropterus salmoides)*	UCB, WET, SAV	Yes	• Habitat potentially impacted by dredging • Recreational species • Top predator
Smallmouth Bass (*Micropterus dolomieui*)	UCB. SAV	Yes	• Habitat potentially impacted by dredging • Recreational species • Predator/invertivore
Common Shiner (*Notropis cornutus*)	UCB, WET, SAV	Yes	• Habitat potentially impacted by dredging • Representative HSI species for Cyprinidae • Forage base for predatory fish and piscivorous wildlife
Carp (*Cyprinus carpio*)	UCB, WET, SAV	No	• Non-native and nuisance species • Species resistant to habitat modification
Bluegill (*Lepomis macrochirus*)	UCB, WET, SAV	Yes	• Large woody debris and SAV provide cover • Recreational species • Forage base for predatory fish and piscivorous wildlife
Channel Catfish (*Ictalurus punctatus*)	UCB, SAV	No	• Non-native species
Reptiles/Amphibians			
Bullfrog (*Rana catesbeiana*)	SHO, WET, SAV	No	• HSI applicable only to Midwestern United States
Slider Turtle (*Pseudemys scripta*)	SHO, WET, SAV	No	• HSI applicable only to Southeastern United States
Snapping Turtle (*Chelydra serpentina*)	SHO, UCB, WET, SAV	Yes	• Small tributaries and backwaters present along river edge • Depths in river exceed ice depth; provides overwintering

Notes:
1. UCB = Unconsolidated river bottom
2. SAV = Submerged aquatic vegetation
3. SHO = Shoreline
4. WET = Wetland

Based on the above evaluation, the key species for which HSI models will be used (as necessary) as a supplement to FCI models for the fish and wildlife function are the belted kingfisher, great blue heron, wood duck, muskrat, mink, yellow perch, largemouth bass, smallmouth bass, common shiner, bluegill, and snapping turtle. Each of these key species is dependent on river habitat that may potentially be directly impacted by sediment removal activities. These species have also been directly or indirectly (e.g., through signs) observed in areas where dredging is likely to occur. The HSI models and data variables to be used for these species are presented in Appendix F. The additional data that were needed to complete the models were described in Section 6.4 of the Phase 1 HA Report and Section 3 of the SHAWP, with SOPs provided in the SHAWP. The most recent HSI model results for all river reaches are presented in Appendix G of the Phase 2 HA Report.

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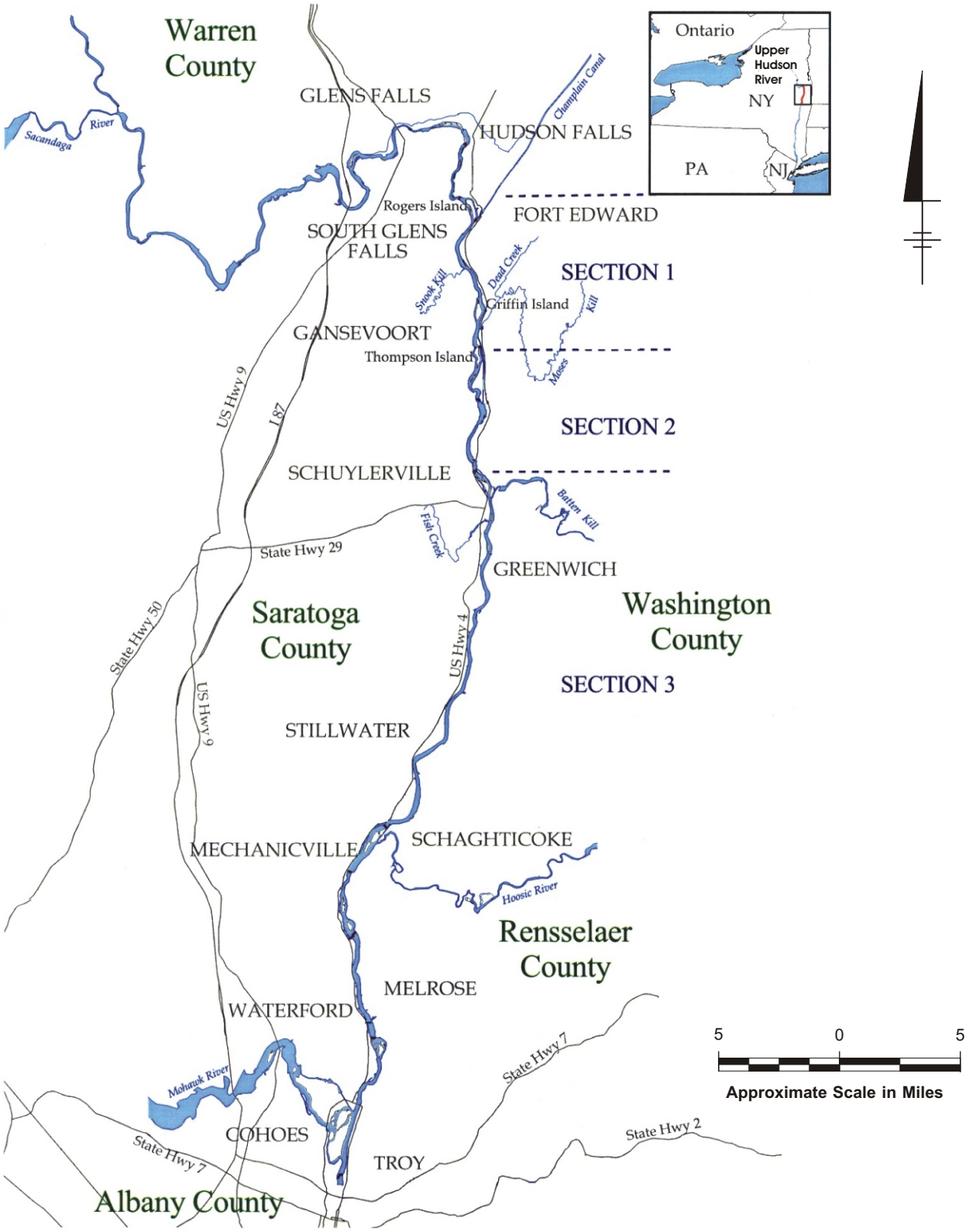
ARCADIS

Figures



NOTE:
Adapted from USEPA Feasibility Study (December 2000)

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBS SUPERFUND SITE
HABITAT DELINEATION REPORT

UPPER HUDSON RIVER

ARCADIS

FIGURE
1

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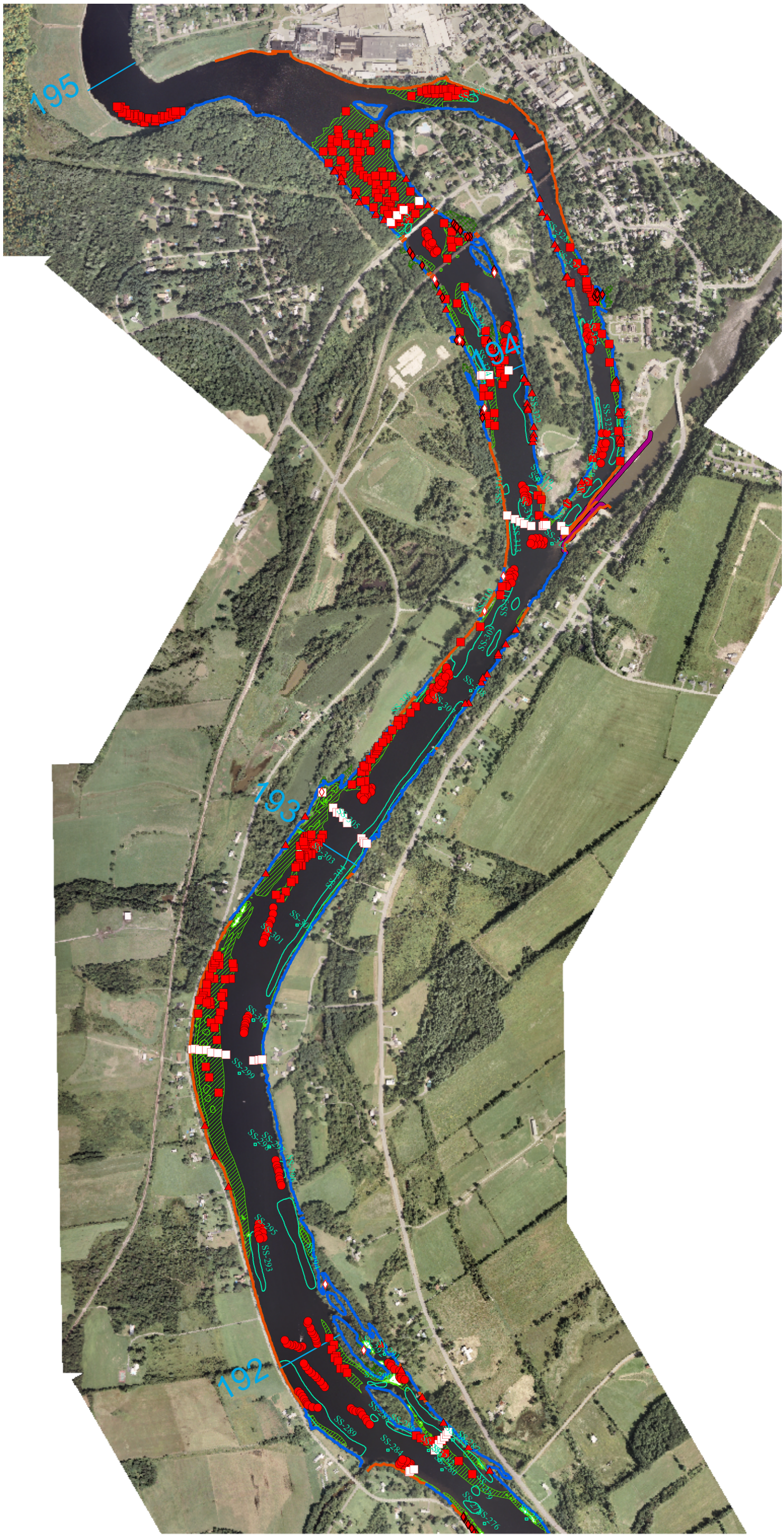
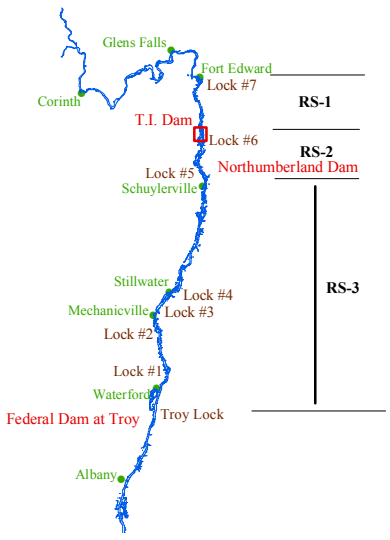


LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 2

Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

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December 2008

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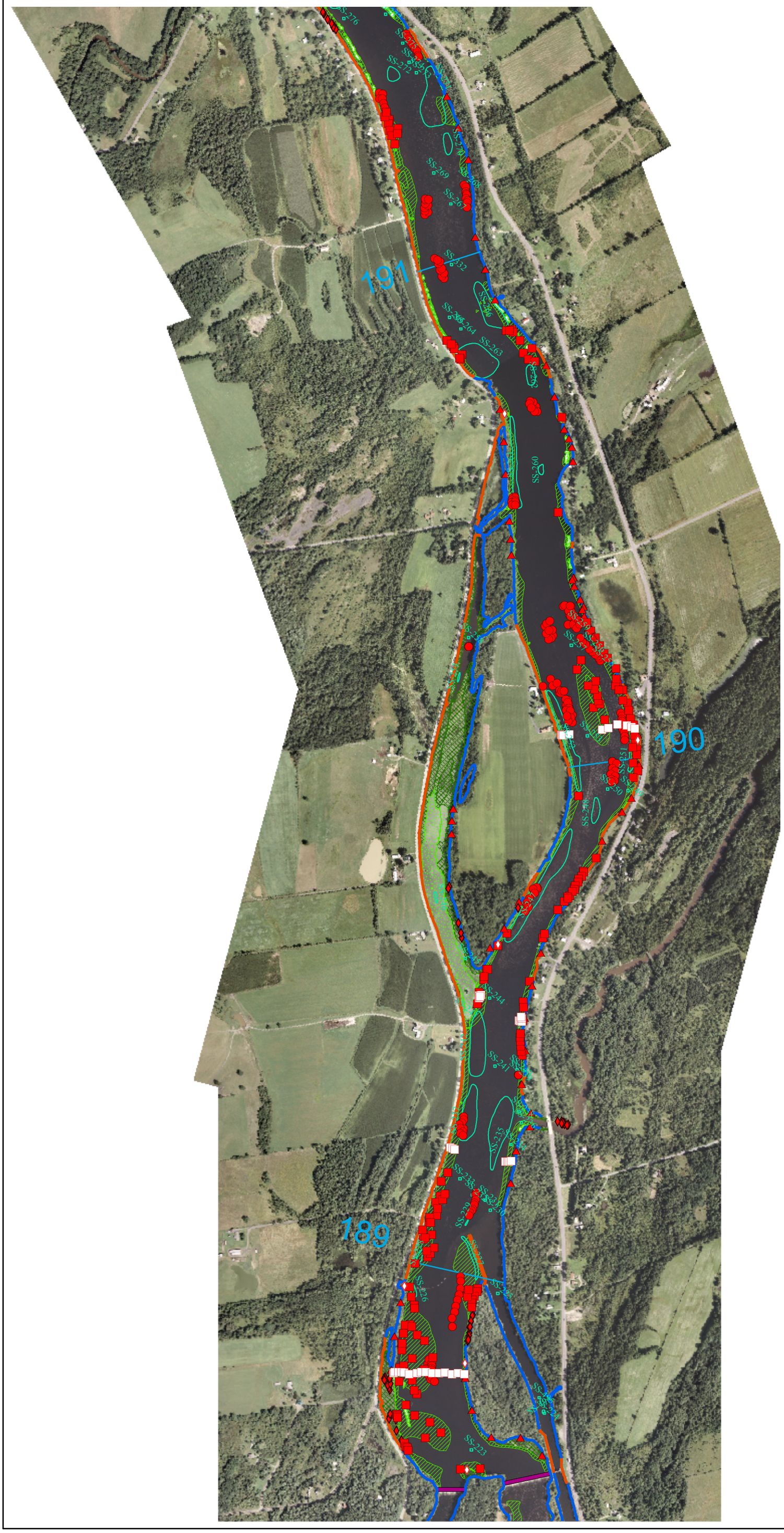
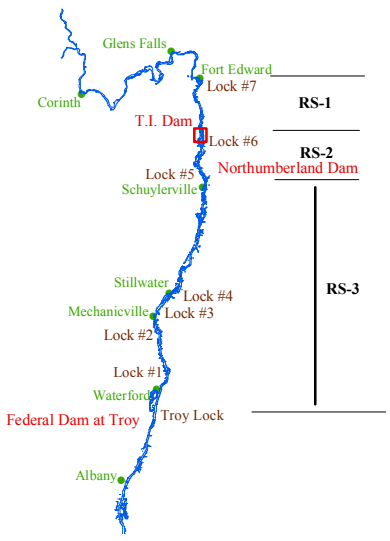


LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

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Hudson River Project

Figure 3

Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

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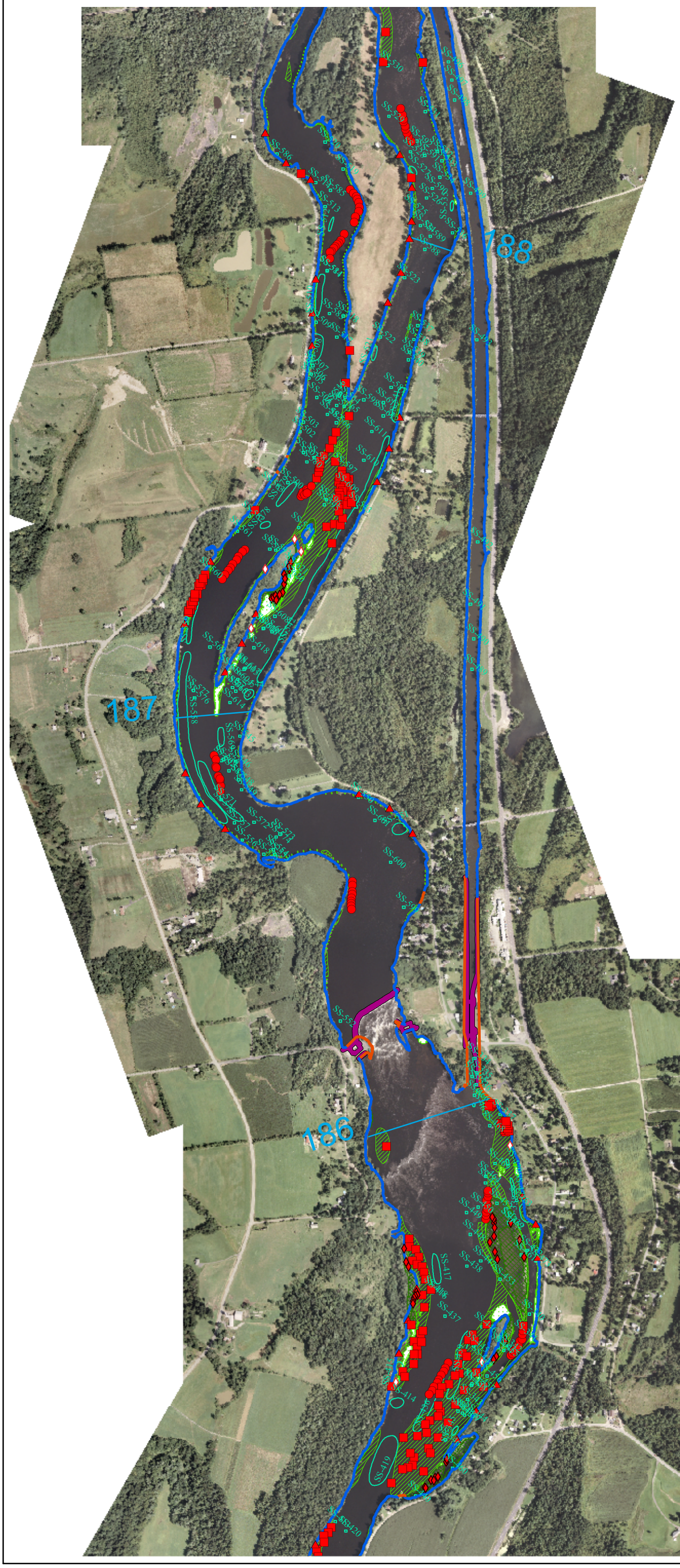
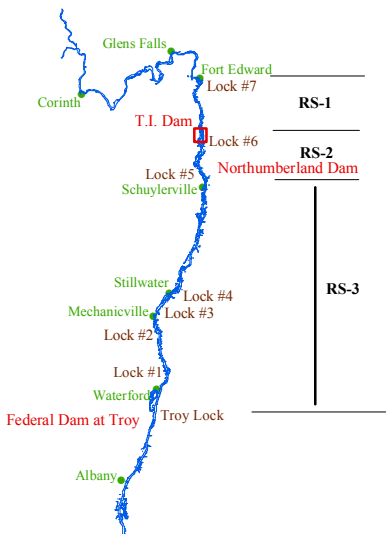


LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 4

Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

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December 2008

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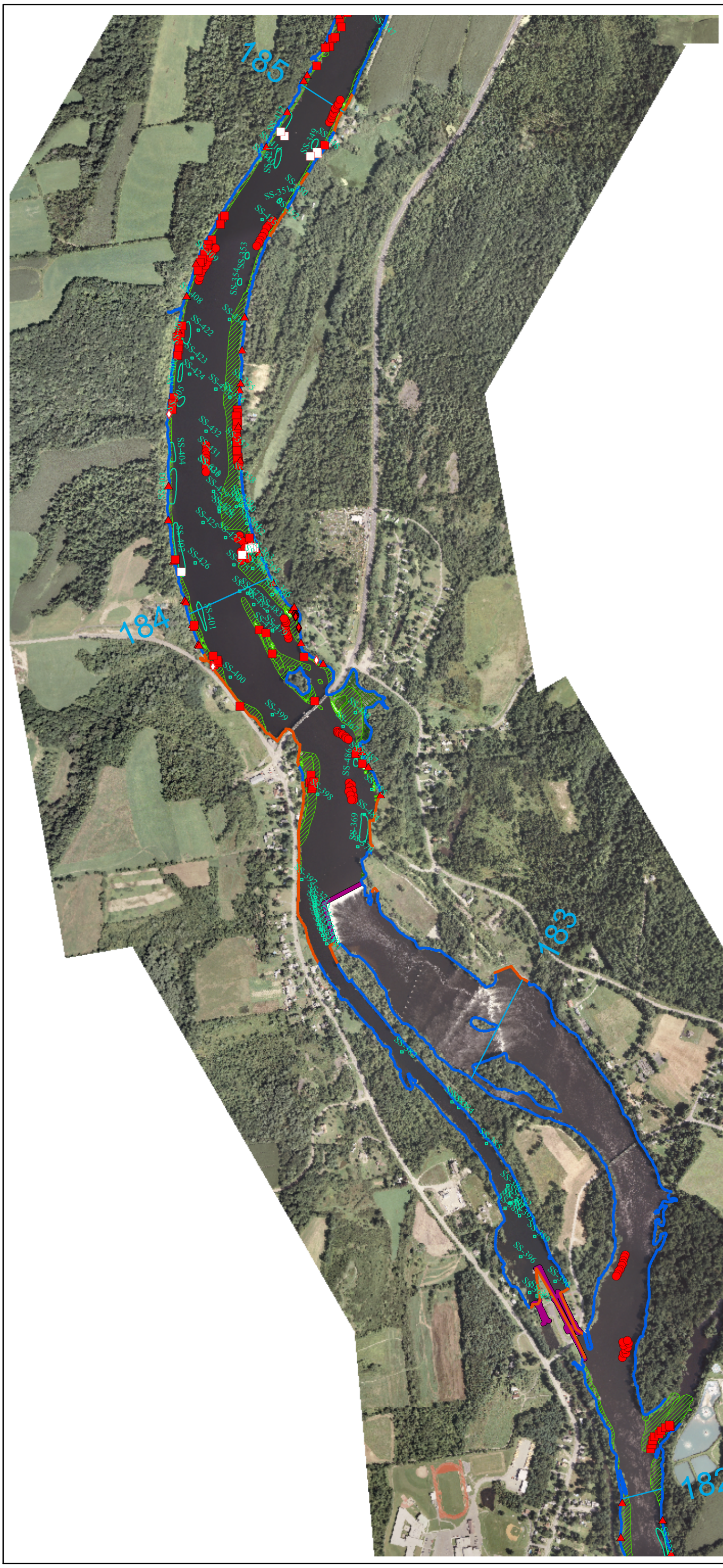
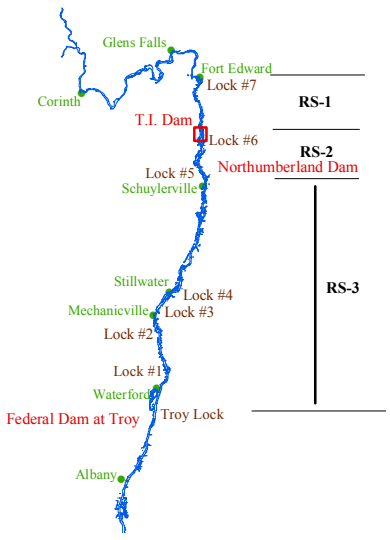


LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 5

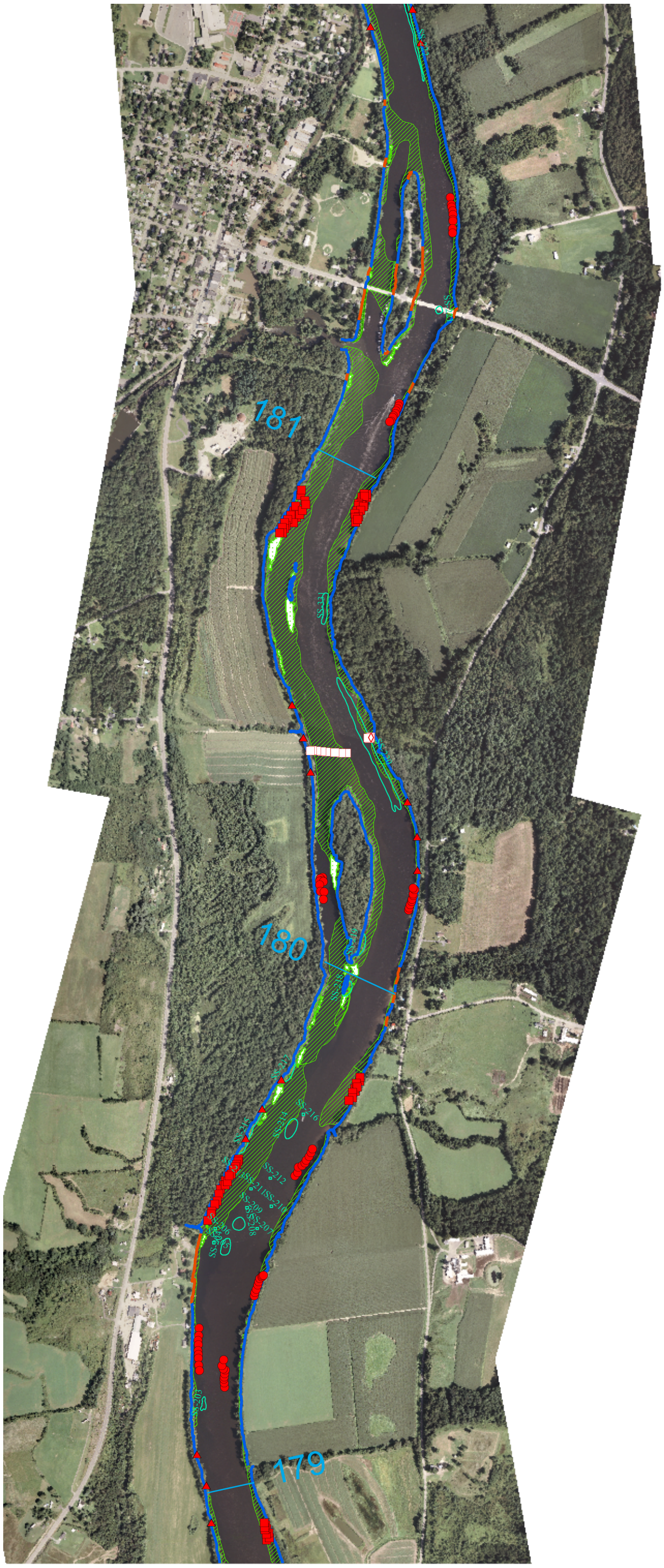
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

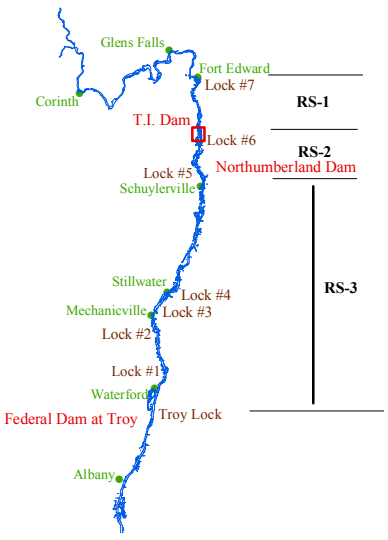
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 6

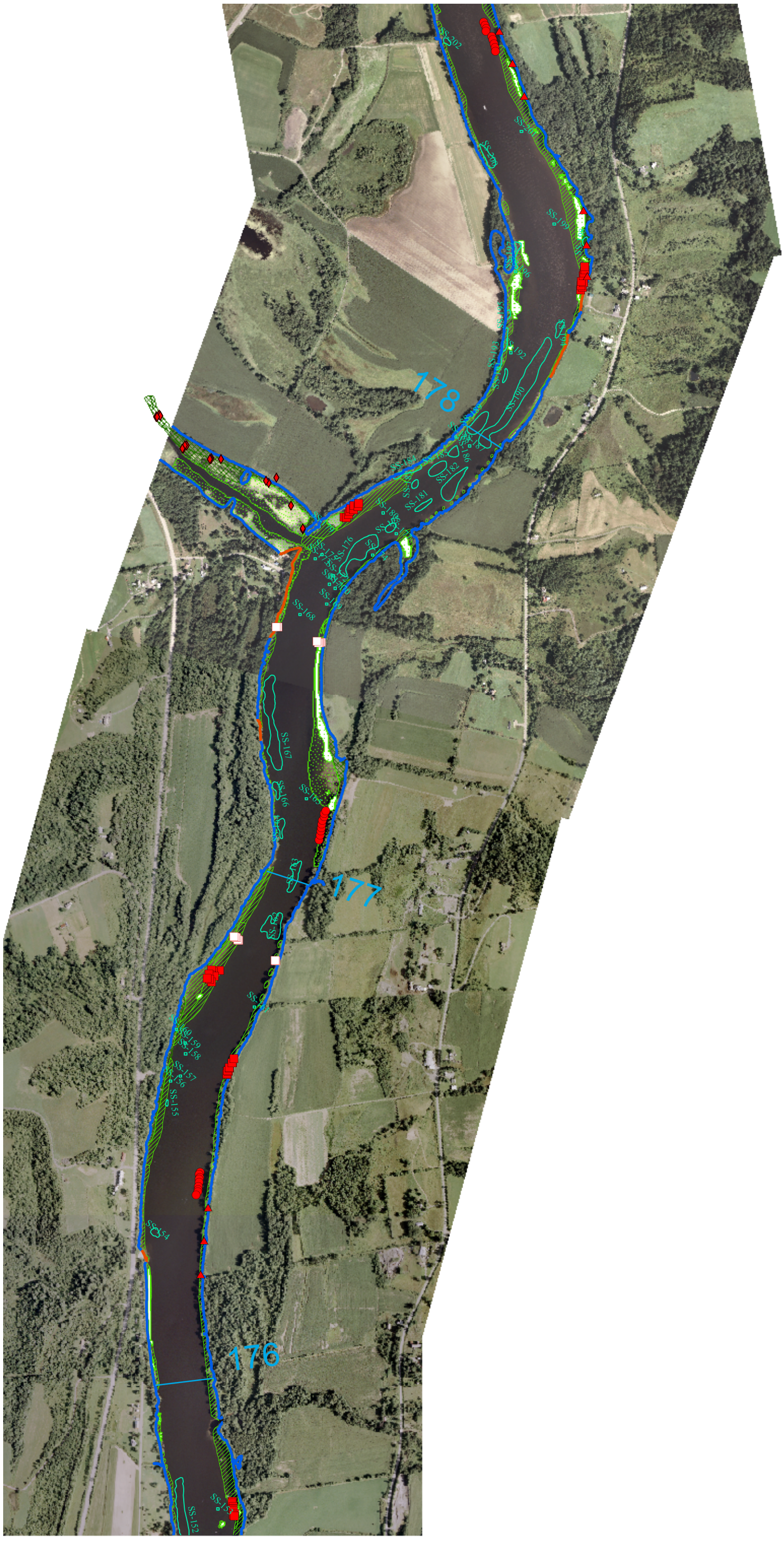
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

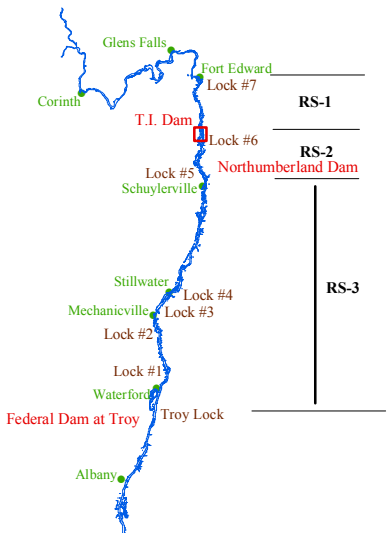
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 7

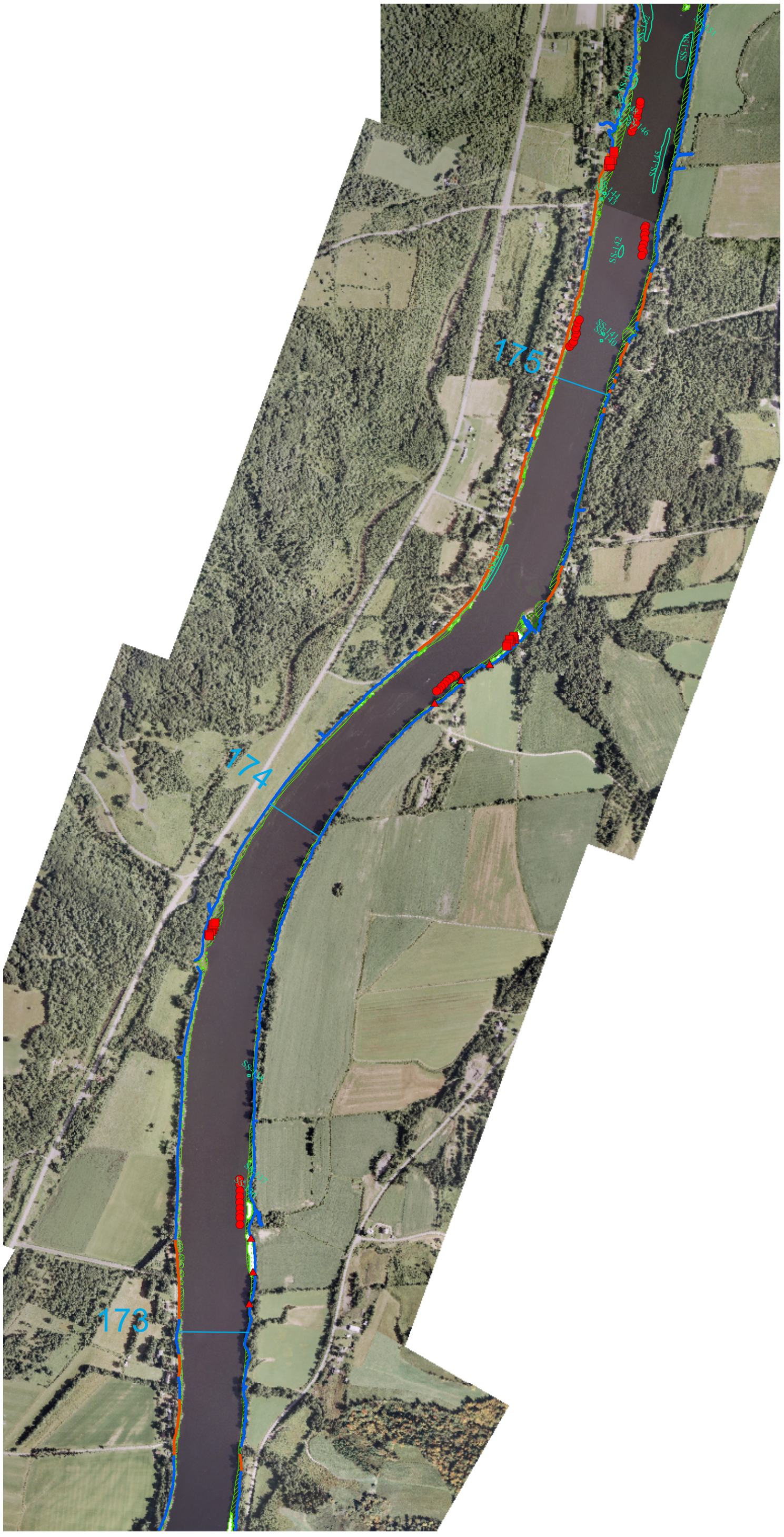
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

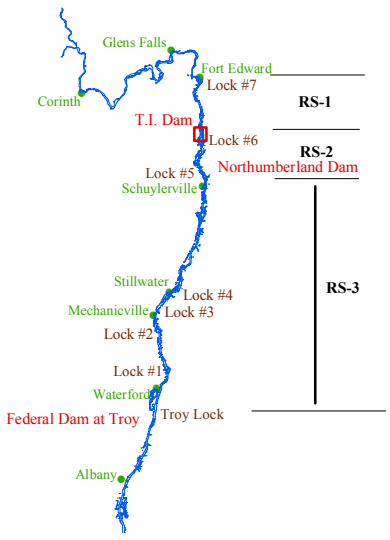
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 8

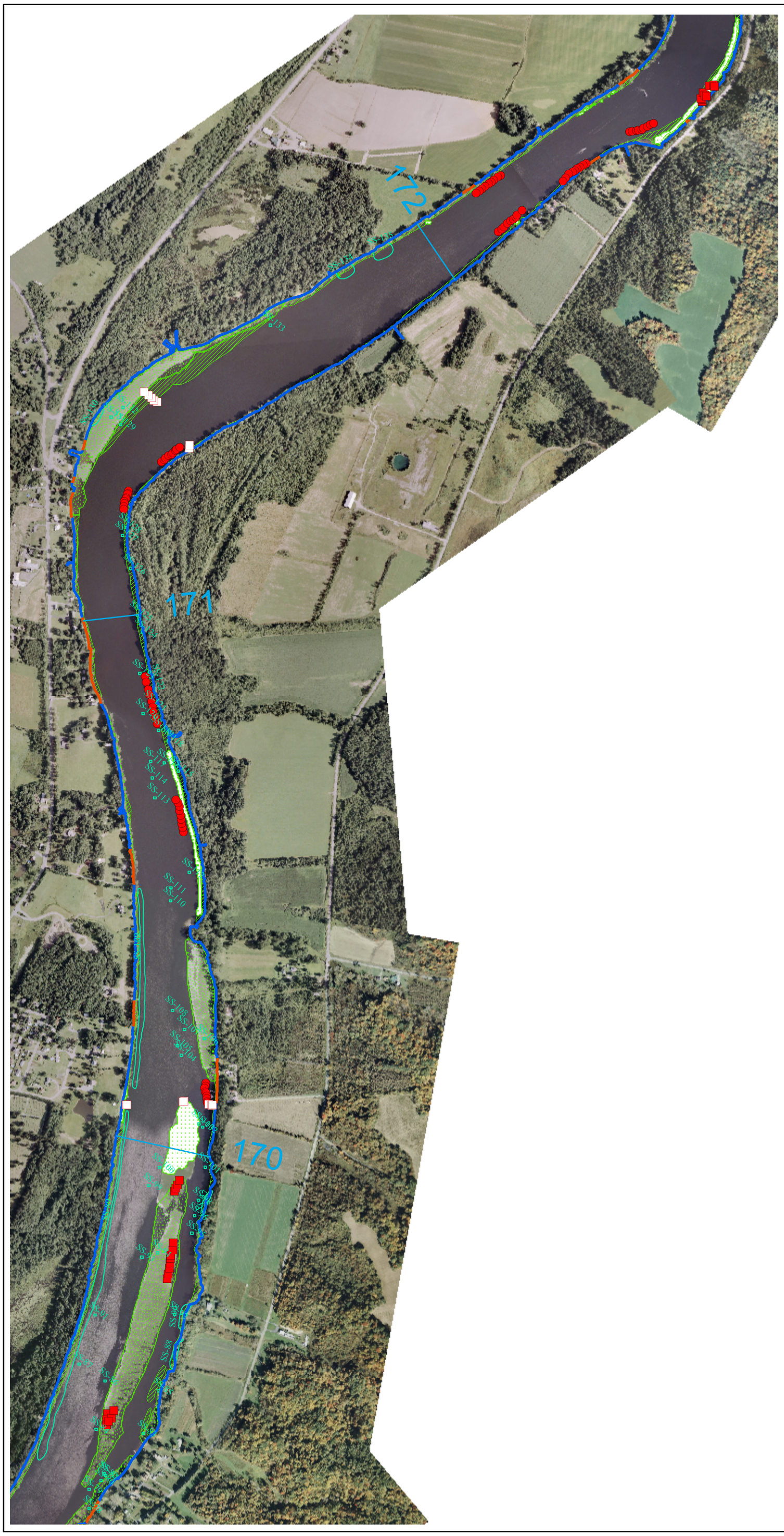
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

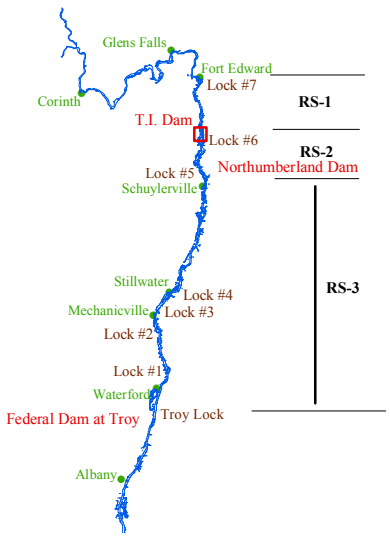
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 9

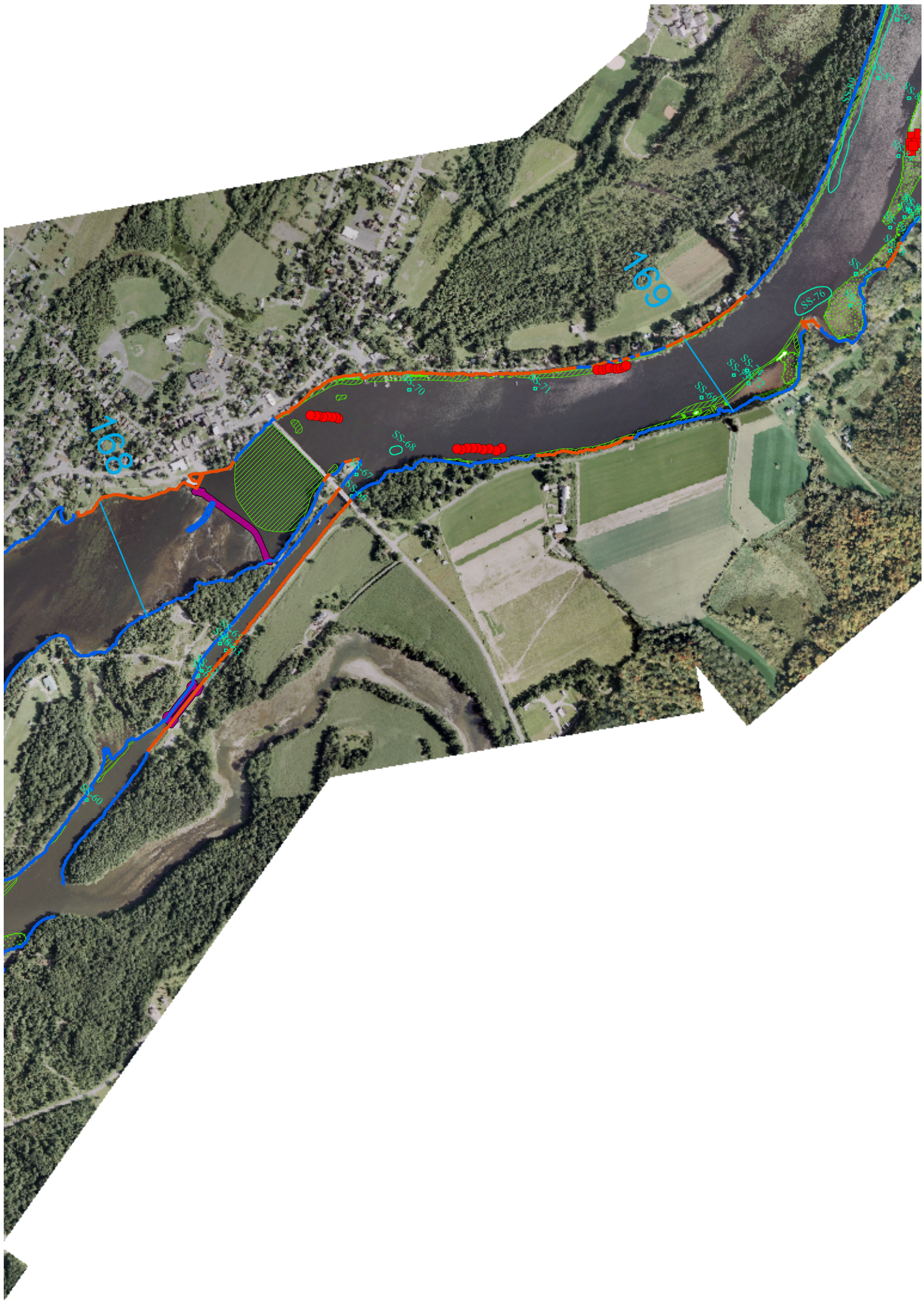
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

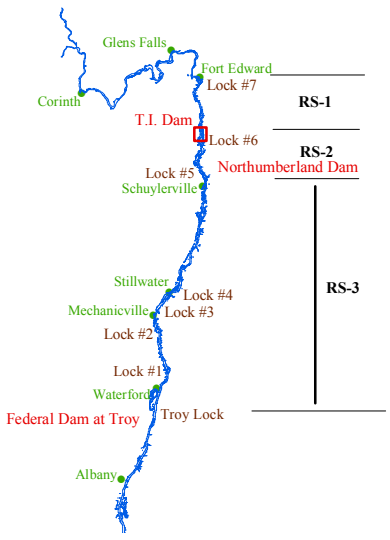
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 10

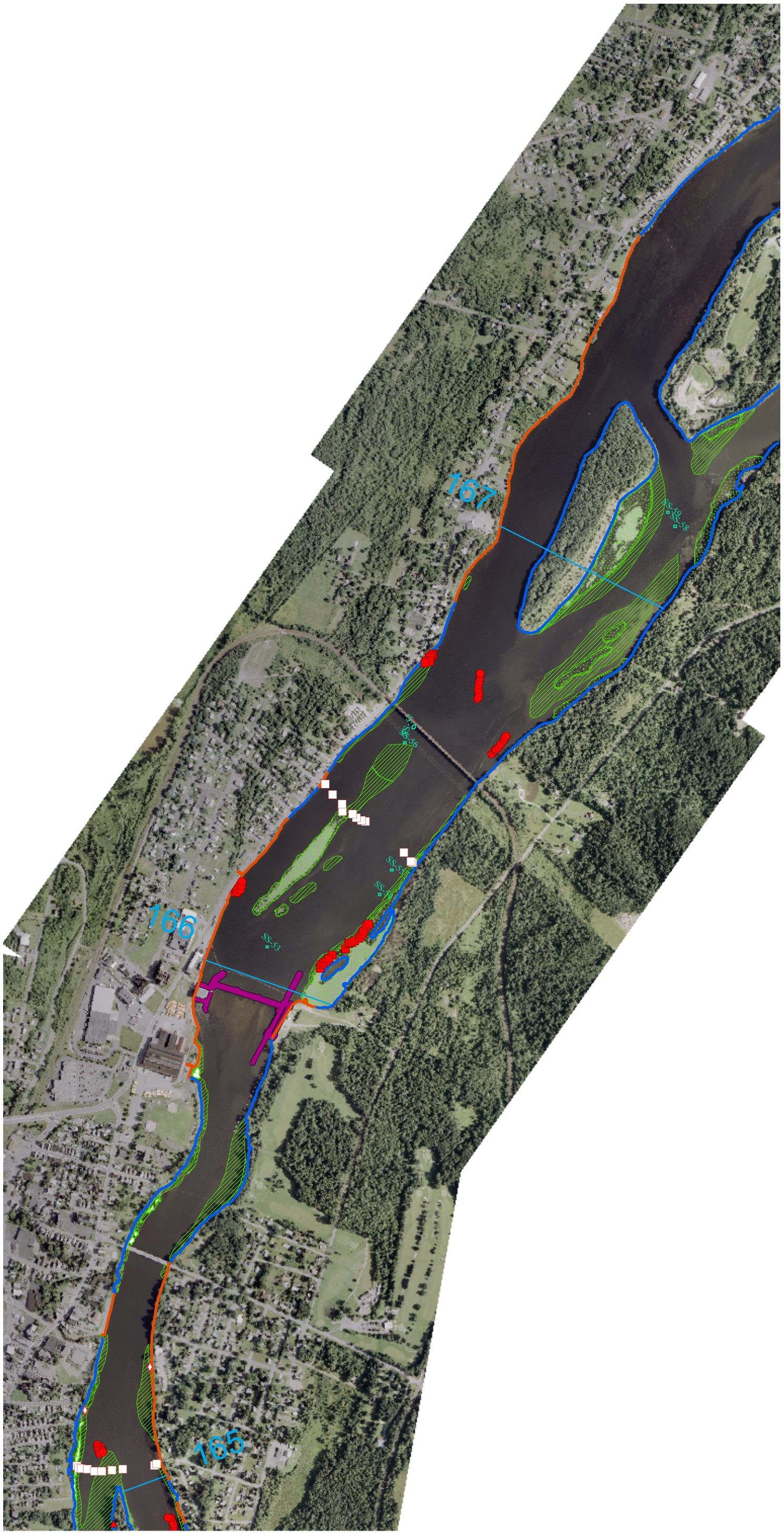
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

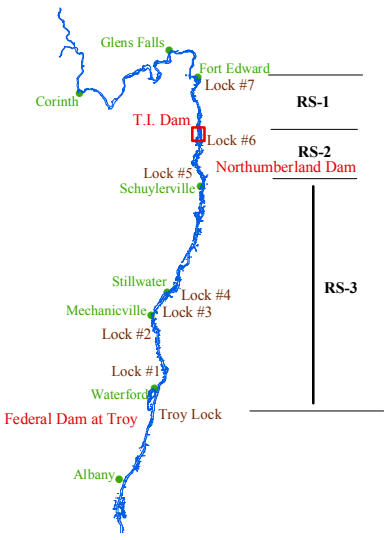
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 11

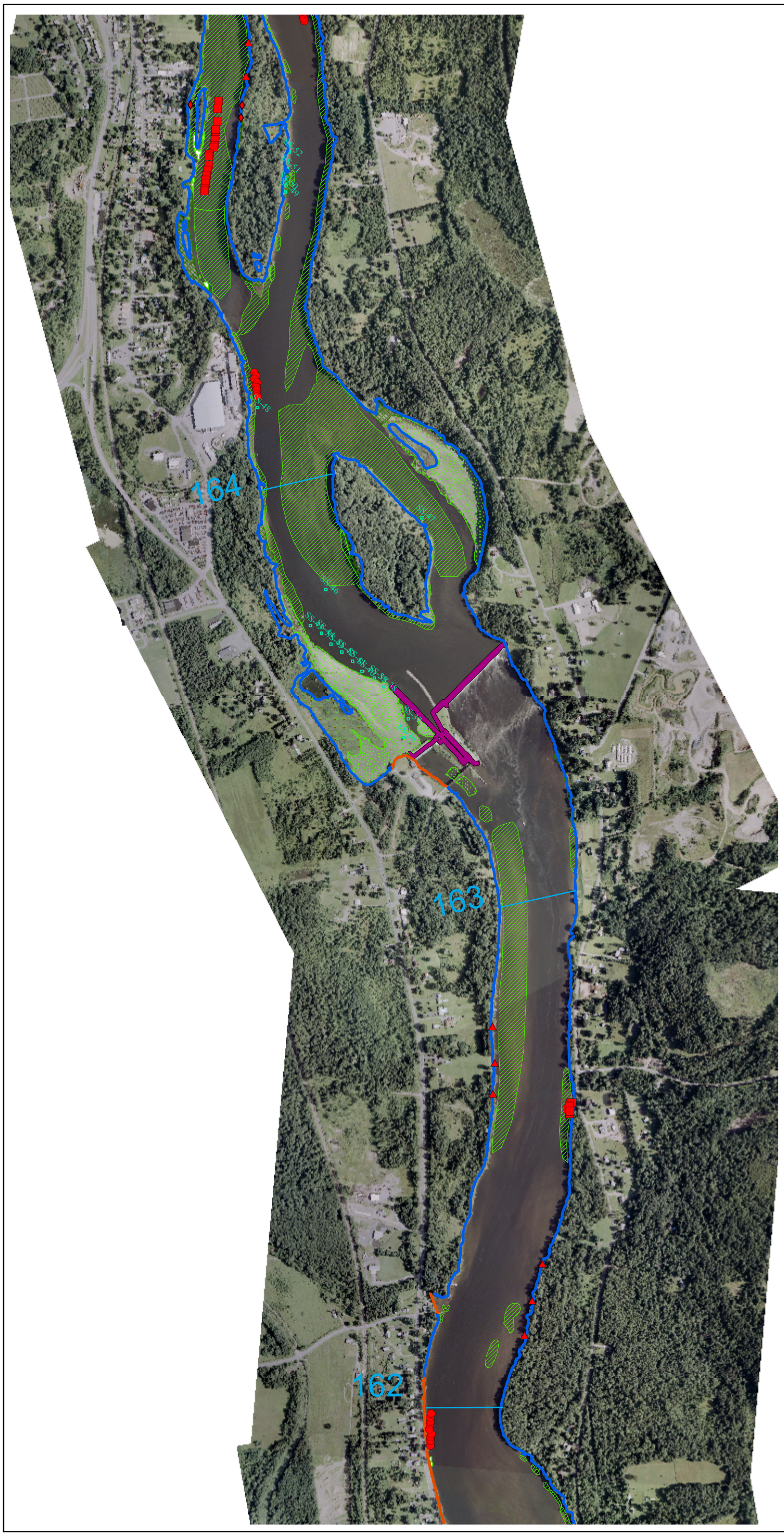
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

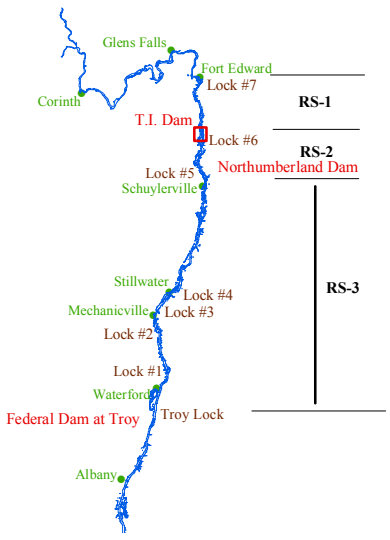
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 12

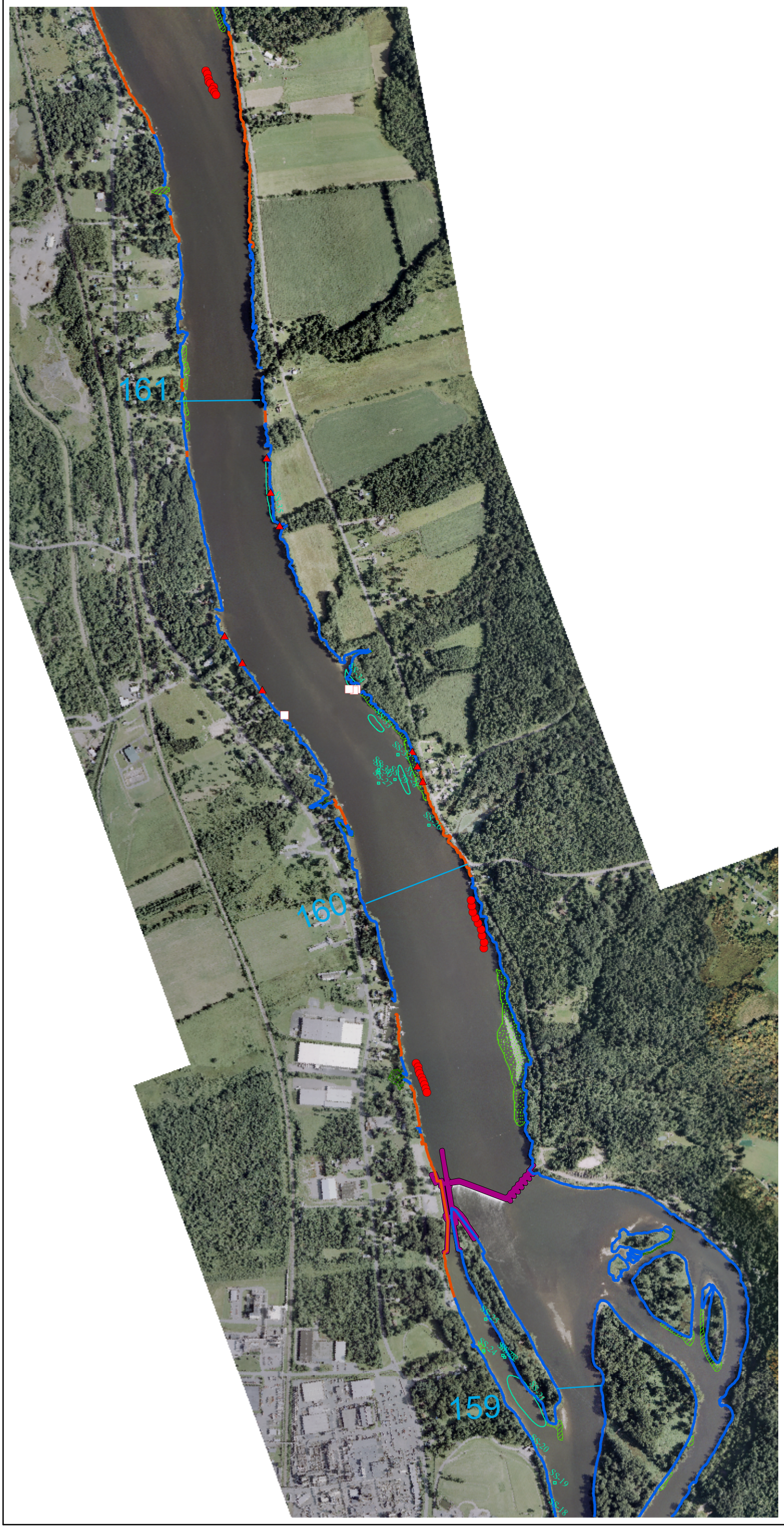
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

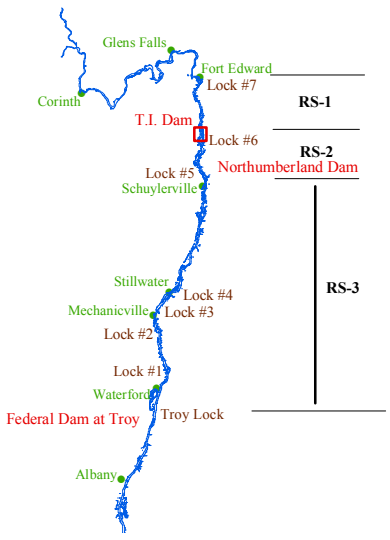
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 13

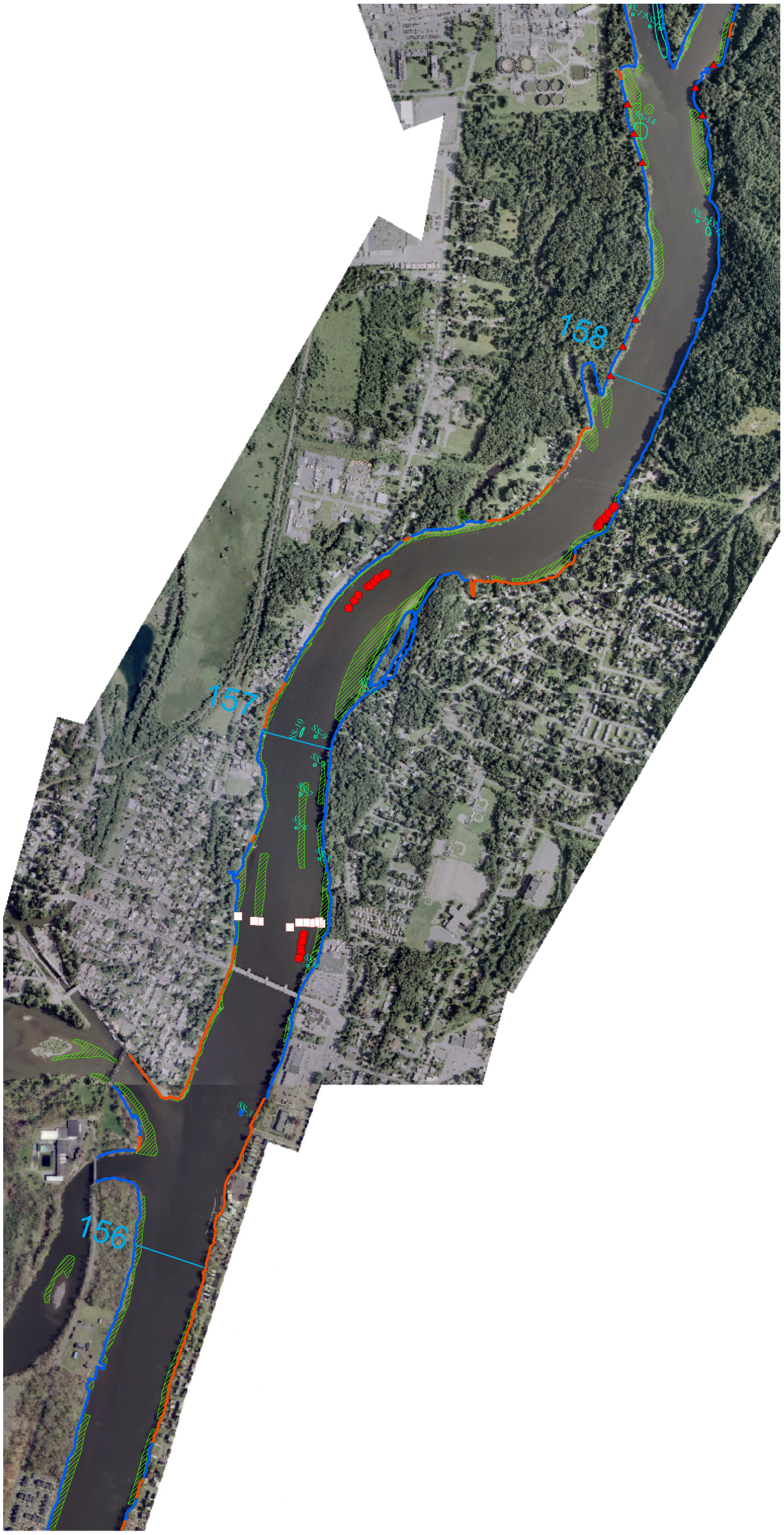
Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

QEA Quantitative Environmental Analysis, LLC

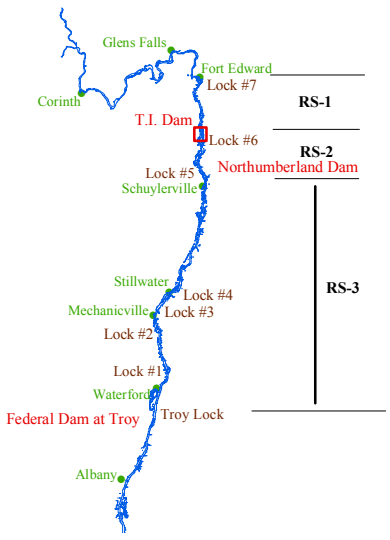
GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd



LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 14

Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

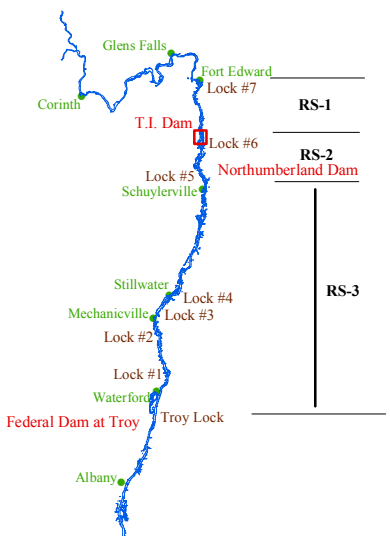
QEA Quantitative Environmental Analysis, LLC

GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd

LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 375 750 1,500

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles

Habitat Shoreline

- Maintained
- Natural
- SSS Debris & Attributes
- Dams and Locks
- SAV
- FAV

Habitat Delineation

- Backwater Wetland
- Fringe Wetland
- Trapa

Notes:
1) 2003 aerial survey photos used.
2) SAV % Cover Adapted from Orth et al.1991.

General Electric Company
Hudson River Project

Figure 15

Habitat Groundtruthing and Assessment Station Locations in the Upper Hudson River Project Area

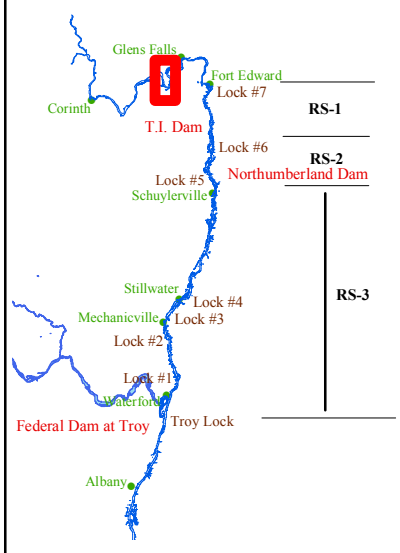
QEA Quantitative Environmental Analysis, LLC

GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Habitat_Assessment_Map_20081205.mxd

LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

Feet

0 500 1,000 2,000

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles
- SSS Debris & Attributes
- Dams and Locks
- NWI Wetlands (USFWS, 1995-1998)
- Wetlands (NYSDEC, 1999-2002)
- Shoreline

General Electric Company
Hudson River Project

Figure 16

Habitat Groundtruthing and Assessment Location in the Off-Site Areas

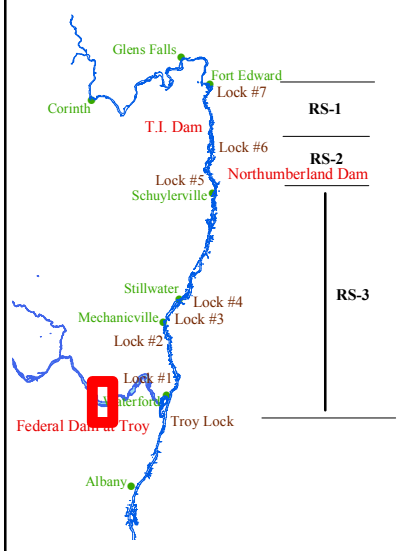
QEA Quantitative Environmental Analysis, LLC

GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Offsite_Assessment_Map_20081205.mxd

LOCATOR MAP OF THE UPPER HUDSON RIVER



GRAPHIC SCALE

0 500 1,000 2,000 Feet

Legend

Groundtruthing Locations

- SAV
- SHO
- WET

Assessment Locations

- SAV
- SHO
- WET
- UCB
- River Miles
- SSS Debris & Attributes
- Dams and Locks
- NWI Wetlands (USFWS, 1995-1998)
- Wetlands (NYSDEC, 1999-2002)
- Shoreline

General Electric Company
Hudson River Project

Figure 17

Habitat Groundtruthing and Assessment Location in the Off-Site Areas

QEA Quantitative Environmental Analysis, LLC

GENhab:112

December 2008

CCY - \\GF_Server\D_DRIVE\GENrem\Working\GIS\maps\ArcGIS8_maps\Habitat_Maps\Offsite_Assessment_Map_20081205.mxd

Appendices

ARCADIS

Appendix A

Groundtruthing Locations in the Project Area: Geographic Coordinates, Observed Species, and Map Changes

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SAV-T01-01	River Section 1	1615725	734139	None	no
G-SAV-T01-02	River Section 1	1615789	734202	Wild Celery (*Vallisneria americana*)	no
G-SAV-T01-03	River Section 1	1615843	734265	Wild Celery (*Vallisneria americana*)	no
				Pondweed sp.(*Potamogeton* sp.)	no
G-SAV-T01-04	River Section 1	1615934	734418	None	no
G-SAV-T02-01	River Section 1	1614208	735029	Wild Celery (*Vallisneria americana*)	no
G-SAV-T02-02	River Section 1	1614213	735049	None	no
G-SAV-T02-03	River Section 1	1614215	735108	Wild Celery (*Vallisneria americana*)	no
G-SAV-T02-04	River Section 1	1614265	735304	Wild Celery (*Vallisneria americana*)	no
G-SAV-T03-01	River Section 1	1612830	735289	None	no
G-SAV-T03-02	River Section 1	1612793	735365	None	no
G-SAV-T03-03	River Section 1	1612765	735415	None	no
G-SAV-T03-04	River Section 1	1612748	735458	None	no
G-SAV-T03-05	River Section 1	1612727	735525	None	no
G-SAV-T03-06	River Section 1	1612727	735641	None	no
G-SAV-T03-07	River Section 1	1612734	735653	Wild Celery (*Vallisneria americana*)	no
G-SAV-T03-08	River Section 1	1612737	735677	Wild Celery (*Vallisneria americana*)	no
G-SAV-T03-09	River Section 1	1612725	735822	None	no
G-SAV-T03-10	River Section 1	1612677	735855	None	no
G-SAV-T04-01	River Section 1	1610097	733462	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T04-02	River Section 1	1609942	733571	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T04-03	River Section 1	1609897	733606	Wild Celery (*Vallisneria americana*)	no
G-SAV-T04-04	River Section 1	1609892	733636	None	no
G-SAV-T04-05	River Section 1	1609846	733669	None	no
G-SAV-T04-06	River Section 1	1609792	733709	None	no
G-SAV-T04-07	River Section 1	1609640	733848	None	no
G-SAV-T04-08	River Section 1	1609608	733868	None	no
G-SAV-T04-09	River Section 1	1609592	733881	Wild Celery (*Vallisneria americana*)	no
G-SAV-T04-10	River Section 1	1609588	733903	Wild Celery (*Vallisneria americana*)	no
				American pondweed (*Potamogeton nodosus*)	no
G-SAV-T05-01	River Section 1	1607559	732178	Wild Celery (*Vallisneria americana*)	no
G-SAV-T05-02	River Section 1	1607564	732205	Wild Celery (*Vallisneria americana*)	no
G-SAV-T05-03	River Section 1	1607549	732253	None	no
G-SAV-T05-04	River Section 1	1607549	732318	Common Waterweed (*Elodea canadensis*)	no
G-SAV-T05-05	River Section 1	1607527	732370	Wild Celery (*Vallisneria americana*)	no
G-SAV-T05-06	River Section 1	1607522	732432	Wild Celery (*Vallisneria americana*)	no
G-SAV-T05-07	River Section 1	1607504	732512	None	no
G-SAV-T05-08	River Section 1	1607449	732784	None	no
G-SAV-T05-09	River Section 1	1607451	732839	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T05-10	River Section 1	1607456	732868	Wild Celery (*Vallisneria americana*)	no
				Pondweed sp.(*Potamogeton* sp.)	no
G-SAV-T06-01	River Section 1	1603384	734323	None	no
G-SAV-T06-02	River Section 1	1603393	734330	None	no
G-SAV-T06-03	River Section 1	1603412	734371	Wild Celery (*Vallisneria americana*)	no
G-SAV-T06-04	River Section 1	1603596	734575	None	no
G-SAV-T06-05	River Section 1	1603624	734592	Wild Celery (*Vallisneria americana*)	no
G-SAV-T06-06	River Section 1	1603657	734614	Wild Celery (*Vallisneria americana*)	no
G-SAV-T06-07	River Section 1	1603703	734641	Wild Celery (*Vallisneria americana*)	no
G-SAV-T06-08	River Section 1	1603730	734668	Wild Celery (*Vallisneria americana*)	no
G-SAV-T06-09	River Section 1	1603754	734689	None	no
G-SAV-T06-10	River Section 1	1603780	734705	Wild Celery (*Vallisneria americana*)	no
G-SAV-T07-01	River Section 1	1595732	737231	Wild Celery (*Vallisneria americana*)	no
G-SAV-T07-02	River Section 1	1595724	737242	Wild Celery (*Vallisneria americana*)	no
G-SAV-T07-03	River Section 1	1595724	737254	None	no
G-SAV-T07-04	River Section 1	1595733	737313	None	no
G-SAV-T07-05	River Section 1	1595785	737638	Redhead Grass (*Potamogeton perfoliatus*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SAV-T07-06	River Section 1	1595802	737704	Pondweed sp.(*Potamogeton* sp.)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T07-07	River Section 1	1595838	737792	Common Waterweed (*Elodea canadensis*)	no
G-SAV-T07-08	River Section 1	1595824	737887	None	no
G-SAV-T07-09	River Section 1	1595809	737933	Wild Celery (*Vallisneria americana*)	no
G-SAV-T07-10	River Section 1	1595794	737966	Wild Celery (*Vallisneria americana*)	no
G-SAV-T08-01	River Section 1	1593130	736412	Wild Celery (*Vallisneria americana*)	no
				Water Chestnut (*Trapa natans*)	yes
G-SAV-T08-02	River Section 1	1593117	736418	Wild Celery (*Vallisneria americana*)	no
G-SAV-T08-03	River Section 1	1593136	736432	Wild Celery (*Vallisneria americana*)	no
G-SAV-T08-04	River Section 1	1593122	736424	Wild Celery (*Vallisneria americana*)	no
G-SAV-T08-05	River Section 1	1593109	736412	Wild Celery (*Vallisneria americana*)	no
G-SAV-T08-06	River Section 1	1592880	736809	None	no
G-SAV-T08-07	River Section 1	1592877	736824	None	no
G-SAV-T08-08	River Section 1	1592872	736840	None	no
G-SAV-T08-09	River Section 1	1592901	736839	Wild Celery (*Vallisneria americana*)	no
G-SAV-T08-10	River Section 1	1592916	736833	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T09-01	River Section 1	1591617	736126	Common Waterweed (*Elodea canadensis*)	no
G-SAV-T09-02	River Section 1	1591606	736150	Common Waterweed (*Elodea canadensis*)	no
G-SAV-T09-03	River Section 1	1591596	736168	None	no
G-SAV-T09-04	River Section 1	1591473	736677	None	no
G-SAV-T09-05	River Section 1	1591473	736698	Wild Celery (*Vallisneria americana*)	no
G-SAV-T09-06	River Section 1	1591475	736711	Wild Celery (*Vallisneria americana*)	no
G-SAV-T09-07	River Section 1	1591479	736731	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T10-01	River Section 1	1589368	735558	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-02	River Section 1	1589373	735570	None	no
G-SAV-T10-03	River Section 1	1589372	735610	None	no
G-SAV-T10-04	River Section 1	1589374	735639	None	no
G-SAV-T10-05	River Section 1	1589369	735665	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-06	River Section 1	1589354	735715	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-07	River Section 1	1589364	735794	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-08	River Section 1	1589375	735835	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-09	River Section 1	1589374	735882	None	no
G-SAV-T10-10	River Section 1	1589365	735947	None	no
G-SAV-T10-11	River Section 1	1589364	736011	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-12	River Section 1	1589369	736073	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-13	River Section 1	1589355	736141	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-14	River Section 1	1589364	736204	Wild Celery (*Vallisneria americana*)	no
G-SAV-T10-15	River Section 1	1589356	736265	Wild Celery (*Vallisneria americana*)	no
G-SAV-T11-01	River Section 2	1571683	735890	Wild Celery (*Vallisneria americana*)	no
G-SAV-T11-02	River Section 2	1571699	735881	Wild Celery (*Vallisneria americana*)	no
G-SAV-T11-03	River Section 2	1571658	735817	None	no
G-SAV-T11-04	River Section 2	1571858	735562	None	no
G-SAV-T11-05	River Section 2	1571897	735524	Wild Celery (*Vallisneria americana*)	no
G-SAV-T12-01	River Section 2	1567819	735268	Wild Celery (*Vallisneria americana*)	no
G-SAV-T12-02	River Section 2	1567826	735250	Wild Celery (*Vallisneria americana*)	no
G-SAV-T12-03	River Section 2	1567816	735218	Patches of unknown low form of moss like plant	no
G-SAV-T12-04	River Section 2	1567754	735149	Patches of unknown low form of moss like plant	no
G-SAV-T12-05	River Section 2	1567584	734553	Wild Celery (*Vallisneria americana*)	no
G-SAV-T13-01	River Section 3	1442592	714426	Wild Celery (*Vallisneria americana*)	no
G-SAV-T13-02	River Section 3	1442610	714402	Wild Celery (*Vallisneria americana*)	no
				Grassy Pondweed (*Potamogeton gramineus*)	no
				Curly Pondweed (*Potamogeton crispus*)	yes
G-SAV-T13-03	River Section 3	1442602	714369	Wild Celery (*Vallisneria americana*)	no
				Redhead Grass (*Potamogeton perfoliatus*)	no
G-SAV-T13-04	River Section 3	1442598	714324	Wild Celery (*Vallisneria americana*)	no
G-SAV-T13-05	River Section 3	1442604	714271	Wild Celery (*Vallisneria americana*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SAV-T13-06	River Section 3	1442600	714208	None	no
G-SAV-T13-07	River Section 3	1442555	714117	None	no
G-SAV-T13-08	River Section 3	1442612	713817	Wild Celery (*Vallisneria americana*)	no
G-SAV-T13-09	River Section 3	1442621	713764	None	no
G-SAV-T13-10	River Section 3	1442664	713604	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T14-01	River Section 3	1460037	715406	Small Pondweed (*Potamogeton pusillus*)	no
				Redhead Grass (Potamogeton perfoliatus)	no
G-SAV-T14-02	River Section 3	1460022	715383	None	no
G-SAV-T14-03	River Section 3	1460034	715332	None	no
G-SAV-T14-04	River Section 3	1459772	714685	None	no
G-SAV-T15-01	River Section 3	1482480	710420	Common Waterweed (Elodea canadensis)	no
G-SAV-T15-02	River Section 3	1482458	710438	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T15-03	River Section 3	1482451	710462	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
				Redhead Grass (*Potamogeton perfoliatus*)	no
G-SAV-T15-04	River Section 3	1482445	710523	Wild Celery (*Vallisneria americana*)	no
G-SAV-T15-05	River Section 3	1482424	710594	Wild Celery (*Vallisneria americana*)	no
G-SAV-T15-06	River Section 3	1482430	710666	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T15-07	River Section 3	1482440	710766	Wild Celery (*Vallisneria americana*)	no
G-SAV-T15-08	River Section 3	1482446	710874	None	no
G-SAV-T15-09	River Section 3	1482484	711186	None	no
G-SAV-T15-10	River Section 3	1482502	711209	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T16-01	River Section 3	1488446	713742	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T16-02	River Section 3	1488461	713725	None	no
G-SAV-T16-03	River Section 3	1488547	713653	None	no
G-SAV-T16-04	River Section 3	1488853	713275	Wild Celery (*Vallisneria americana*)	no
G-SAV-T16-05	River Section 3	1488864	713234	Wild Celery (*Vallisneria americana*)	no
G-SAV-T16-06	River Section 3	1488888	713185	Wild Celery (*Vallisneria americana*)	no
G-SAV-T16-07	River Section 3	1488930	713147	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T16-08	River Section 3	1488952	713048	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
				Coontail (*Ceratophyllum demersum*)	no
				Water Chestnut (*Trapa natans*)	yes
G-SAV-T16-09	River Section 3	1489027	713043	None	no
G-SAV-T16-10	River Section 3	1489124	712950	Wild Celery (*Vallisneria americana*)	no
G-SAV-T16-11	River Section 3	1489223	712876	None	no
G-SAV-T17-01	River Section 3	1502241	724808	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T17-02	River Section 3	1502236	724815	Wild Celery (*Vallisneria americana*)	no
				Algae sp.	no
G-SAV-T17-03	River Section 3	1502273	725388	Yellow Floating Heart (*Nymphoides peltata*)	yes
G-SAV-T17-04	River Section 3	1502266	725378	None	no
G-SAV-T17-05	River Section 3	1502245	725637	None	no
G-SAV-T17-06	River Section 3	1502235	725665	Wild Celery (*Vallisneria americana*)	no
G-SAV-T17-07	River Section 3	1502236	725672	Wild Celery (*Vallisneria americana*)	no
				Yellow Floating Heart (*Nymphoides peltata*)	yes
				Wild Rice (*Zizania aquatica*)	no
G-SAV-T18-01	River Section 3	1508808	725440	Wild Celery (*Vallisneria americana*)	no
G-SAV-T18-02	River Section 3	1508839	725443	None	no
G-SAV-T18-03	River Section 3	1509269	725118	Common Waterweed (Elodea canadensis)	no
				Redhead Grass (*Potamogeton perfoliatus*)	no
G-SAV-T18-04	River Section 3	1509283	725084	Common Waterweed (Elodea canadensis)	no
				Eurasian Water Milfoil (*Myriophyllum spicatum*)	yes

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SAV-T18-05	River Section 3	1509310	725061	Wild Celery (*Vallisneria americana*)	no
				Redhead Grass (*Potamogeton perfoliatus*)	no
G-SAV-T18-06	River Section 3	1509337	725031	Small Pondweed (*Potamogeton pusillus*)	no
G-SAV-T18-07	River Section 3	1509371	724990	Water Chestnut (*Trapa natans*)	yes
G-SAV-T19-01	River Section 3	1533551	735940	Wild Celery (*Vallisneria americana*)	no
G-SAV-T19-02	River Section 3	1533555	735931	None	no
G-SAV-T19-03	River Section 3	1533755	735573	Common Waterweed (Elodea canadensis)	no
G-SAV-T19-04	River Section 3	1533764	735562	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
				Eurasian Water Milfoil (*Myriophyllum spicatum*)	yes
				Small Pondweed (*Potamogeton pusillus*)	no
G-SAV-T19-05	River Section 3	1533781	735550	None	no
G-SAV-T19-06	River Section 3	1533788	735540	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
				Algae sp.	no
G-SAV-T19-07	River Section 3	1533793	735527	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
				Algae sp.	no
G-SAV-T20-01	River Section 3	1536693	736390	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T20-02	River Section 3	1536692	736375	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
				Yellow Floating Heart (*Nymphoides peltata*)	yes
				Coontail (*Ceratophyllum demersum*)	no
G-SAV-T20-03	River Section 3	1536689	736368	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
				Yellow Floating Heart (*Nymphoides peltata*)	yes
				Coontail (*Ceratophyllum demersum*)	no
G-SAV-T20-04	River Section 3	1536688	736359	Wild Celery (*Vallisneria americana*)	no
				Common Waterweed (*Elodea canadensis*)	no
G-SAV-T20-05	River Section 3	1536704	736345	None	no
G-SAV-T20-06	River Section 3	1536847	735960	None	no
G-SAV-T20-07	River Section 3	1536842	735943	None	no
G-SAV-T21-01	River Section 3	1550917	738948	Wild Celery (*Vallisneria americana*)	no
G-SAV-T21-02	River Section 3	1550908	738939	Wild Celery (*Vallisneria americana*)	no
G-SAV-T21-03	River Section 3	1550904	738932	Wild Celery (*Vallisneria americana*)	no
G-SAV-T21-04	River Section 3	1550908	738919	None	no
G-SAV-T21-05	River Section 3	1550761	738713	Wild Celery (*Vallisneria americana*)	no
G-SAV-T21-06	River Section 3	1550763	738664	Wild Celery (*Vallisneria americana*)	no
G-SAV-T21-07	River Section 3	1550767	738602	Wild Celery (*Vallisneria americana*)	no
G-SAV-T21-08	River Section 3	1550771	738518	Wild Celery (*Vallisneria americana*)	no
				Redhead Grass (*Potamogeton perfoliatus*)	no
G-SAV-T21-09	River Section 3	1550776	738475	Wild Celery (*Vallisneria americana*)	no
				Redhead Grass (*Potamogeton perfoliatus*)	no
G-SAV-T21-10	River Section 3	1550784	738423	Wild Celery (*Vallisneria americana*)	no
G-SAV-T21-11	River Section 3	1550787	738385	Algae sp.	no
G-SAV-T21-12	River Section 3	1550782	738363	Algae sp.	no
G-SHO-01-DN	River Section 1	1588548	736530	Yellow Flag (*Iris pseudacorus*)	yes
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-01-UP	River Section 1	1589609	736136	Yellow Flag (*Iris pseudacorus*)	yes
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
G-SHO-02-DN	River Section 1	1593631	736909	Wild Grape spp. (*Vitus spp.*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Northern White Cedar (*Thuja occidentalis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
G-SHO-02-UP	River Section 1	1594681	737459	Wild Grape spp. (*Vitus spp.*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Northern White Cedar (*Thuja occidentalis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
G-SHO-03-DN	River Section 1	1594866	737599	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Japanses Knot Weed (*Polygonum cuspidatum*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Lilly sp.	no
G-SHO-03-UP	River Section 1	1596201	737728	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Japanses Knot Weed (*Polygonum cuspidatum*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Lilly sp.	no
G-SHO-04-DN	River Section 1	1598210	737134	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Apple spp. (Malus *spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-04-UP	River Section 1	1599899	736600	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Apple spp. (Malus *spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
G-SHO-05-UP	River Section 1	1603278	735046	Yellow Flag (*Iris pseudacorus*)	yes
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Jewel Weed spp. (*Impatiens spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Woodland Sunflower (*Helianthus divaricatus*)	no
				Cattail spp. (*Typha spp.*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
G-SHO-05-DN	River Section 1	1603276	735044	Yellow Flag (*Iris pseudacorus*)	yes
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Jewel Weed spp. (*Impatiens spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Woodland Sunflower (*Helianthus divaricatus*)	no
				Cattail spp. (*Typha spp.*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-06-DN	River Section 1	1607082	732805	Yellow Flag (*Iris pseudacorus*)	yes
				Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				American Basswood (*Tilia americana*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Weeping Willow (*Salix babylonica*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				White Pine (*Pinus strobus*)	no
				Grey Birch (*Betula populifolia*)	no
G-SHO-06-UP	River Section 1	1609681	733828	Yellow Flag (*Iris pseudacorus*)	yes
				Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				American Basswood (*Tilia americana*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Weeping Willow (*Salix babylonica*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				White Pine (*Pinus strobus*)	no
				Grey Birch (*Betula populifolia*)	no
G-SHO-07-DN	River Section 1	1612621	735762	Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Japanses Knot Weed (*Polygonum cuspidatum*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Pickerel Weed (*Pontederia cordata*)	no
				Woodland Sunflower (*Helianthus divaricatus*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				White Pine (*Pinus strobus*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				White Snakeroot (*Eupatorium rugosum*)	no
				Qeen Anne's Lace (Daucus carota)	no
				Wild Morning Glory (*Calystegia sepium*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-07-UP	River Section 1	1615840	735730	Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Japanses Knot Weed (*Polygonum cuspidatum*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Pickerel Weed (*Pontederia cordata*)	no
				Woodland Sunflower (*Helianthus divaricatus*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				White Pine (*Pinus strobus*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				White Snakeroot (*Eupatorium rugosum*)	no
				Qeen Anne's Lace (Daucus carota)	no
				Wild Morning Glory (*Calystegia sepium*)	no
G-SHO-08-UP	River Section 1	1615098	734783	Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Woodland Sunflower (*Helianthus divaricatus*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Common Buckthorn (*Rhamnus cathartica*)	yes
				Common Elderberry (*Sambucus canadensis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				High Bush Cranberry (*Viburnum edule*)	no
				Bittersweet spp. (*Celastrus spp.*)	yes
				Eastern Cottonwood (*Populus deltoides*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-08-DN	River Section 1	1614344	735061	Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Woodland Sunflower (*Helianthus divaricatus*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Common Buckthorn (*Rhamnus cathartica*)	yes
				Common Elderberry (*Sambucus canadensis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				High Bush Cranberry (*Viburnum edule*)	no
				Bittersweet spp. (*Celastrus spp.*)	yes
				Eastern Cottonwood (*Populus deltoides*)	no
G-SHO-09-UP	River Section 1	1612340	735391	Black Willow (*Salix nigra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Qeen Anne's Lace (Daucus carota)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
G-SHO-09-DN	River Section 1	1611340	734802	Black Willow (*Salix nigra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Qeen Anne's Lace (Daucus carota)	no
				Soft-stem Bullrush (*Scirpus validus*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-10-UP	River Section 1	1608830	732733	Yellow Sneezeweed (*Helenium autumnale*)	no
				Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Cow Parsnip (*Heracleum lanatum*)	no
G-SHO-10-DN	River Section 1	1606237	732645	Yellow Sneezeweed (*Helenium autumnale*)	no
				Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Cow Parsnip (*Heracleum lanatum*)	no
G-SHO-11-UP	River Section 1	1603320	734571	Yellow Sneezeweed (*Helenium autumnale*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Qeen Anne's Lace (Daucus carota)	no
				Chestnut Oak (*Quercus prinus*)	no
				White Oak (*Quercus alba*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-11-DN	River Section 1	1599392	736378	Yellow Sneezeweed (*Helenium autumnale*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Qeen Anne's Lace (Daucus carota)	no
				Chestnut Oak (*Quercus prinus*)	no
				White Oak (*Quercus alba*)	no
G-SHO-12-UP	River Section 1	1599381	736382	Yellow Sneezeweed (*Helenium autumnale*)	no
				Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				American Basswood (*Tilia americana*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Weeping Willow (*Salix babylonica*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Brown Gound Nut (*Apios americana*)	no
				Common Mullen (*Verbascum thapsus*)	no
				Aster spp. (*Aster spp.*)	no
				Red Maple (*Acer rubra*)	no
G-SHO-12-DN	River Section 1	1595739	737325	Yellow Sneezeweed (*Helenium autumnale*)	no
				Black Willow (*Salix nigra*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				American Basswood (*Tilia americana*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Sensitive Fern (*Onoclea sensibilis*)	no
				Weeping Willow (*Salix babylonica*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Brown Gound Nut (*Apios americana*)	no
				Common Mullen (*Verbascum thapsus*)	no
				Aster spp. (*Aster spp.*)	no
				Red Maple (*Acer rubra*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-13-UP	River Section 1	1592840	736438	Yellow Flag (*Iris pseudacorus*)	yes
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				New York Fern (*Thelypteris noveboracensis*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Common Elderberry (*Sambucus canadensis*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-SHO-13-DN	River Section 1	1590921	735935	Yellow Flag (*Iris pseudacorus*)	yes
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				New York Fern (*Thelypteris noveboracensis*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Common Elderberry (*Sambucus canadensis*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-SHO-14-UP	River Section 1	1590911	735921	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Pickerel Weed (*Pontederia cordata*)	no
				Cattail spp. (*Typha spp.*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-SHO-14-DN	River Section 1	1589442	735674	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Pickerel Weed (*Pontederia cordata*)	no
				Cattail spp. (*Typha spp.*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-SHO-15-UP	River Section 2	1572422	736168	Red Maple (*Acer rubra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Slippery Elm (*Ulmus rubra*)	no
				Green Ash (*Fraxinus pennsylvanica*)	no
				White Oak (*Quercus alba*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Crack Willow (*Salix fragilis*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-15-DN	River Section 2	1570698	735200	Red Maple (*Acer rubra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Slippery Elm (*Ulmus rubra*)	no
				Green Ash (*Fraxinus pennsylvanica*)	no
				White Oak (*Quercus alba*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Crack Willow (*Salix fragilis*)	no
G-SHO-16-UP	River Section 2	1570091	734633	Black Willow (*Salix nigra*)	no
				Red Oak (*Quercus rubra*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Red Maple (*Acer rubra*)	no
				White Pine (*Pinus strobus*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Woodland Sunflower (*Helianthus divaricatus*)	no
				Green Ash (*Fraxinus pennsylvanica*)	no
				Sugar Maple (*Acer Saccharum*)	no
G-SHO-17-UP	River Section 2	1567053	734746	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Green Ash (*Fraxinus pennsylvanica*)	no
				Sugar Maple (*Acer Saccharum*)	no
				Red Maple (*Acer rubra*)	no
G-SHO-18-UP	River Section 2	1566311	735973	Quaking Aspen (*Populus tremuloides*)	no
				White Cow Lilly (*Nymphoides variegatum*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Stiff Arrowhead (*Sagittaria rigida*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
				Wool Grass (*Scirpus cyperinus*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Red Maple (*Acer rubra*)	no
				Crack Willow (*Salix fragilis*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
G-SHO-19-UP	River Section 3	1443538	713861	Silver Maple (*Acer Saccharinum*)	no
				Red Oak (*Quercus rubra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				Staghorn Sumac (*Rhus typhina*)	no
				Red Maple (*Acer rubra*)	no
				Green Ash (*Fraxinus pennsylvanica*)	no
				Crack Willow (*Salix fragilis*)	no
				White Oak (*Quercus alba*)	no
				Eastern Cottonwood (*Populus deltoides*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-19-DN	River Section 3	1442227	713582	Silver Maple (*Acer Saccharinum*)	no
				Red Oak (*Quercus rubra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				Staghorn Sumac (*Rhus typhina*)	no
				Red Maple (*Acer rubra*)	no
				Green Ash (*Fraxinus pennsylvanica*)	no
				Crack Willow (*Salix fragilis*)	no
				White Oak (*Quercus alba*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
G-SHO-20-UP	River Section 3	1467336	713657	Dogwood spp. (*Cornus spp.*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				Red Maple (*Acer rubra*)	no
				Crack Willow (*Salix fragilis*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Slippery Elm (*Ulmus rubra*)	no
				Sycamore (*Platanus occidentalis*)	no
				Box Elder (*Acer negundo)*	no
G-SHO-20-UP	River Section 3	1465770	714216	Dogwood spp. (*Cornus spp.*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				Red Maple (*Acer rubra*)	no
				Crack Willow (*Salix fragilis*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Slippery Elm (*Ulmus rubra*)	no
				Sycamore (*Platanus occidentalis*)	no
				Box Elder (*Acer negundo)*	no
G-SHO-21-UP	River Section 3	1483282	710633	Wild Grape spp. (*Vitus spp.*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Crack Willow (*Salix fragilis*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Sycamore (*Platanus occidentalis*)	no
				Box Elder (*Acer negundo)*	no
				Wild Rice (*Zizania aquatica*)	no
				Yellow Lilly (*Lilium canadense*)	no
				Cattail spp. (*Typha spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Soft-stem Bullrush (*Scirpus validus*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Mulberry spp. (*Morus spp.*)	no
				Sugar Maple (*Acer Saccharum*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-21-DN	River Section 3	1481721	710438	Wild Grape spp. (*Vitus spp.*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Crack Willow (*Salix fragilis*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Sycamore (*Platanus occidentalis*)	no
				Box Elder (*Acer negundo)*	no
				Wild Rice (*Zizania aquatica*)	no
				Yellow Lilly (*Lilium canadense*)	no
				Cattail spp. (*Typha spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Soft-stem Bullrush (*Scirpus validus*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Mulberry spp. (*Morus spp.*)	no
				Sugar Maple (*Acer Saccharum*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
G-SHO-22-UP	River Section 3	1489853	713524	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Box Elder (*Acer negundo)*	no
				Fern sp.	no
G-SHO-22-DN	River Section 3	1489323	712933	Black Willow (*Salix nigra*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Box Elder (*Acer negundo)*	no
				Fern sp.	no
G-SHO-23-UP	River Section 3	1499722	725162	Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Wild Rice (*Zizania aquatica*)	no
				Yellow Lilly (*Lilium canadense*)	no
				Weeping Willow (*Salix babylonica*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-23-DN	River Section 3	1498428	724552	Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Wild Rice (*Zizania aquatica*)	no
				Yellow Lilly (*Lilium canadense*)	no
				Weeping Willow (*Salix babylonica*)	no
G-SHO-24-UP	River Section 3	1510757	727398	Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Yellow Lilly (*Lilium canadense*)	no
				White Ash (*Fraxinus americana*)	no
				Fern sp.	no
				Bur Oak (*Quercus macrocarpa*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Rice Cut Grass (*Leersia oryzoides*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Common Mullen (*Verbascum thapsus*)	no
				Barberry spp. (*Berberis spp.*)	no
G-SHO-24-DN	River Section 3	1510078	726214	Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				Yellow Lilly (*Lilium canadense*)	no
				White Ash (*Fraxinus americana*)	no
				Fern sp.	no
				Bur Oak (*Quercus macrocarpa*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Rice Cut Grass (*Leersia oryzoides*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Common Mullen (*Verbascum thapsus*)	no
				Barberry spp. (*Berberis spp.*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-25-UP	River Section 3	1524033	734551	Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Grey Birch (*Betula populifolia*)	no
				White Pine (*Pinus strobus*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Crack Willow (*Salix fragilis*)	no
				White Oak (*Quercus alba*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				White Ash (*Fraxinus americana*)	no
				Shagbark Hickory (*Carya ovata*)	no
G-SHO-25-DN	River Section 3	1523096	734302	Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Northern Catalpa (*Catalpa speciosa*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Grey Birch (*Betula populifolia*)	no
				White Pine (*Pinus strobus*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Crack Willow (*Salix fragilis*)	no
				White Oak (*Quercus alba*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				White Ash (*Fraxinus americana*)	no
				Shagbark Hickory (*Carya ovata*)	no
G-SHO-26-UP	River Section 3	1536731	736378	Black Willow (*Salix nigra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Milkweed spp. (*Asclepias spp.*)	no
				Aster spp. (*Bidens spp.*)	no
				Common Clotbur (*Xanthium chinense*)	no
				Dogbane spp. (*Apocynum spp.*)	no
				Three-way Sedge (*Dulichium arundinaceum*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-SHO-26-DN	River Section 3	1535097	736461	Black Willow (*Salix nigra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Milkweed spp. (*Asclepias spp.*)	no
				Aster spp. (*Bidens spp.*)	no
				Common Clotbur (*Xanthium chinense*)	no
				Dogbane spp. (*Apocynum spp.*)	no
				Three-way Sedge (*Dulichium arundinaceum*)	no
G-SHO-27-UP	River Section 3	1550589	739079	Black Willow (*Salix nigra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				White Pine (*Pinus strobus*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Sugar Maple (*Acer Saccharum*)	no
				Yellow Lilly (*Lilium canadense*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Fern sp.	no
				Shagbark Hickory (*Carya ovata*)	no
				Dogbane spp. (*Apocynum spp.*)	no
G-SHO-27-DN	River Section 3	1549035	739241	Black Willow (*Salix nigra*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Red Oak (*Quercus rubra*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Silver Maple (*Acer Saccharinum*)	no
				White Ash (*Fraxinus americana*)	no
				Elm spp. (*Ulmus spp.*)	no
				American Basswood (*Tilia americana*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				White Pine (*Pinus strobus*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Sugar Maple (*Acer Saccharum*)	no
				Yellow Lilly (*Lilium canadense*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Fern sp.	no
				Shagbark Hickory (*Carya ovata*)	no
				Dogbane spp. (*Apocynum spp.*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-01-DN	River Section 1	1591251	736712	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Willow spp. (*Salix spp.*)	no
G-WET-01-UP	River Section 1	1591308	736732	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Willow spp. (*Salix spp.*)	no
G-WET-02-DN	River Section 1	1591793	736838	Sensitive Fern (*Onoclea sensibilis*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Black Cherry (*Prunis serotina*)	no
				Sedge spp. (*Carex spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Shag Bark Hickory (*Carya ovata*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
G-WET-02-UP	River Section 1	1591796	737082	Sensitive Fern (*Onoclea sensibilis*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Virginia Creeper (*Parthenocissus quinqefolia*)	no
				Black Cherry (*Prunis serotina*)	no
				Sedge spp. (*Carex spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Shag Bark Hickory (*Carya ovata*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
G-WET-03-DN	River Section 1	1591891	737069	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Common Burdock (*Arctium minus*)	no
				Wild Grape spp. (*Vitus spp.*)	no
G-WET-03-UP	River Section 1	1592011	736876	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Common Burdock (*Arctium minus*)	no
				Wild Grape spp. (*Vitus spp.*)	no
G-WET-04-DN	River Section 1	1603425	735100	Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Elm spp. (*Ulmus spp.*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-04-UP	River Section 1	1603447	735135	Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Wild Grape spp. (*Vitus spp.*)	no
				Elm spp. (*Ulmus spp.*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
G-WET-05-DN	River Section 1	1603471	735162	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Sedge spp. (*Carex spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				Cattail spp. (*Typha spp.*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Black Ash (*Fraxinus nigra*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
G-WET-05-UP	River Section 1	1603508	735105	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Sedge spp. (*Carex spp.*)	no
				Black Locust (*Robinia pseudoacacia*)	yes
				Cattail spp. (*Typha spp.*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Black Ash (*Fraxinus nigra*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
G-WET-06-DN	River Section 1	1604313	734064	Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Sedge spp. (*Carex spp.*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
G-WET-06-UP	River Section 1	1604586	733875	Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Sedge spp. (*Carex spp.*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
G-WET-07	River Section 1	1604590	733872	Purple Loosestrife (*Lythrum salicaria*)	yes
				Fern sp.	no
				Silver Maple (*Acer Saccharinum*)	no
				Shag Bark Hickory (*Carya ovata*)	no
				Ash sp.	no
				White Snakeroot (*Eupatorium rugosum*)	no
G-WET-08	River Section 1	1605240	733493	Fern sp.	no
				Willow spp. (*Salix spp.*)	no
				Elm spp. (*Ulmus spp.*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
G-WET-09-DN	River Section 1	1614881	736251	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Eastern Cottonwood (*Populus deltoides*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-09-UP	River Section 1	1615075	736110	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Eastern Cottonwood (*Populus deltoides*)	no
G-WET-10	River Section 1	1615222	735164	Fern sp.	no
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-WET-11-UP	River Section 1	1615711	734749	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Willow spp. (*Salix spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Arrow Arum (*Peltandra virginica*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
G-WET-11-DN	River Section 1	1615579	734905	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Willow spp. (*Salix spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Arrow Arum (*Peltandra virginica*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
G-WET-12-UP	River Section 1	1588696	736540	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Cattail spp. (*Typha spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Sweet Flag (*Acorus calamus*)	no
G-WET-12-DN	River Section 1	1588457	737094	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Cattail spp. (*Typha spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Cardinal Flower (*Lobelia cardinalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Sweet Flag (*Acorus calamus*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-13-DN	River Section 1	1589670	736291	Sensitive Fern (*Onoclea sensibilis*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Speckled Alder (*Alnus rugosa*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Cattail spp. (*Typha spp.*)	no
				Black Ash (*Fraxinus nigra*)	no
				White Snakeroot (*Eupatorium rugosum*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Wild Rice (*Zizania aquatica*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Grey Birch (*Betula populifolia*)	no
				Winged Monkey Flower (*Mimulus alatus*)	no
G-WET-13-UP	River Section 1	1590077	736353	Sensitive Fern (*Onoclea sensibilis*)	no
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Speckled Alder (*Alnus rugosa*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Cattail spp. (*Typha spp.*)	no
				Black Ash (*Fraxinus nigra*)	no
				White Snakeroot (*Eupatorium rugosum*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Wild Rice (*Zizania aquatica*)	no
				Quaking Aspen (*Populus tremuloides*)	no
				Grey Birch (*Betula populifolia*)	no
				Winged Monkey Flower (*Mimulus alatus*)	no
G-WET-14-DN	River Section 1	1605465	733377	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Black Ash (*Fraxinus nigra*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
G-WET-14-UP	River Section 1	1605665	733371	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Black Ash (*Fraxinus nigra*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
G-WET-15	River Section 1	1595682	737996	Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
G-WET-16	River Section 1	1589462	736271	Sensitive Fern (*Onoclea sensibilis*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Sedge spp. (*Carex spp.*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Winged Monkey Flower (*Mimulus alatus*)	no
G-WET-17	River Section 1	1614565	734819	Purple Loosestrife (*Lythrum salicaria*)	yes
				Tatarian Honeysuckle (*Lonicera tatarica*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Sedge spp. (*Carex spp.*)	no
				Staghorn Sumac (*Rhus typhina*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Cattail spp. (*Typha spp.*)	no
				Arrow Arum (*Peltandra virginica*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-18-DN1	River Section 1	1614569	735098	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Arrow Arum (*Peltandra virginica*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Common Elderberry (*Sambucus canadensis*)	no
				Speckled Alder (*Alnus rugosa*)	no
G-WET-18-UP	River Section 1	1614379	735195	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Arrow Arum (*Peltandra virginica*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Common Elderberry (*Sambucus canadensis*)	no
				Speckled Alder (*Alnus rugosa*)	no
G-WET-18-DN2	River Section 1	1614633	735186	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Arrow Arum (*Peltandra virginica*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Common Elderberry (*Sambucus canadensis*)	no
				Speckled Alder (*Alnus rugosa*)	no
G-WET-19	River section 1	1613884	735067	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-WET-20-DN	River Section 1	1610127	733643	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Willow spp. (*Salix spp.*)	no
				Elm spp. (*Ulmus spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Cattail spp. (*Typha spp.*)	no
				Black Ash (*Fraxinus nigra*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Common Reed (*Phragmities australis)*	yes
G-WET-20-UP	River Section 1	1610196	733614	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Willow spp. (*Salix spp.*)	no
				Elm spp. (*Ulmus spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				Cattail spp. (*Typha spp.*)	no
				Black Ash (*Fraxinus nigra*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Common Reed (*Phragmities australis)*	yes

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-21-UP	River Section 1	1602987	734855	Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Elm spp. (*Ulmus spp.*)	no
				Cattail spp. (*Typha spp.*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Pickerel Weed (*Pontederia cordata*)	no
G-WET-21-DN	River Section 1	1602746	735037	Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Elm spp. (*Ulmus spp.*)	no
				Cattail spp. (*Typha spp.*)	no
				Arrow Arum (*Peltandra virginica*)	no
				Pickerel Weed (*Pontederia cordata*)	no
G-WET-22-UP	River Section 1	1593408	736473	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Willow spp. (*Salix spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Wild Rice (*Zizania aquatica*)	no
				Yellow Flag (*Iris pseudacorus*)	yes
G-WET-22-DN	River Section 1	1593249	736395	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Willow spp. (*Salix spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Wild Rice (*Zizania aquatica*)	no
				Yellow Flag (*Iris pseudacorus*)	yes
G-WET-23-UP	River Section 1	1589400	735553	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Cattail spp. (*Typha spp.*)	no
				Black Ash (*Fraxinus nigra*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Chairmakers Rush (*Scirpus pungens*)	no
G-WET-23-DN	River Section 1	1588415	735830	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Cattail spp. (*Typha spp.*)	no
				Black Ash (*Fraxinus nigra*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Chairmakers Rush (*Scirpus pungens*)	no
G-WET-24	River Section 1	1588399	736293	Pickerel Weed (*Pontederia cordata*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Yellow Flag (*Iris pseudacorus*)	yes
G-WET-25-UP	River Section 1	1615518	734290	Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Boneset (*Eupatorium perfoliatum*)	no
				Royal Fern (*Osmunda regalis*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-25-DN	River Section 1	1615225	734516	Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Boneset (*Eupatorium perfoliatum*)	no
				Royal Fern (*Osmunda regalis*)	no
G-WET-26	River Section 1	1615161	734573	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				Jewel Weed spp. (*Impatiens spp.*)	no
				Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Ostrich Fern (*Matteuccia struthiopteris*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
G-WET-27-UP	River Section 1	1613923	735065	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-27-DN	River Section 1	1613729	735083	Purple Loosestrife (*Lythrum salicaria*)	yes
				Sensitive Fern (*Onoclea sensibilis*)	no
				Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-28	River Section 1	1612228	735252	Purple Loosestrife (*Lythrum salicaria*)	yes
				Speckled Alder (*Alnus rugosa*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Wool Grass (*Scirpus cyperinus*)	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-29	River Section 1	1611883	735067	Joe Pye Weed spp. (*Eupatorium spp.*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Wool Grass (*Scirpus cyperinus*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
G-WET-30-UP	River Section 1	1610853	734248	Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
G-WET-30-DN	River Section 1	1610716	734135	Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
G-WET-31	River Section 1	1610095	733459	Silver Maple (*Acer Saccharinum*)	no
				Dogwood spp. (*Cornus spp.*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Sweet Flag (*Acorus calamus*)	no
G-WET-32-UP	River Section 1	1608885	732640	Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-WET-32-DN	River Section 1	1608822	732585	Purple Loosestrife (*Lythrum salicaria*)	yes
				Dogwood spp. (*Cornus spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-33-UP	River Section 1	1608010	732236	Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-33-DN	River Section 1	1607925	732231	Dogwood spp. (*Cornus spp.*)	no
				Willow spp. (*Salix spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-34-DN	River Section 1	1605756	732705	Sensitive Fern (*Onoclea sensibilis*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-WET-34-UP	River Section 1	1605862	732669	Sensitive Fern (*Onoclea sensibilis*)	no
				Speckled Alder (*Alnus rugosa*)	no
				Golden Rod spp. (*Solidago spp.*)	no
				Wild Grape spp. (*Vitus spp.*)	no
				Yellow Sneezeweed (*Helenium autumnale*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-WET-35	River Section 1	1598934	736670	Purple Loosestrife (*Lythrum salicaria*)	yes
				Silver Maple (*Acer Saccharinum*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-36	River Section 1	1593643	736602	Silver Maple (*Acer Saccharinum*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
G-WET-37	River Section 1	1590236	735668	Sedge spp. (*Carex spp.*)	no
				Pickerel Weed (*Pontederia cordata*)	no
				ButtonBush (*Cephalanthus occidentalis*)	no
				Turtle Head (*Chelone glabra*)	no
G-WET-38-UP	River Section 2	1565653	735726	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
G-WET-38-DN	River Section 2	1565560	735759	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
G-WET-39	River Section 2	1566655	734863	Rice Cut Grass (*Leersia oryzoides*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
				Dogbane spp. (*Apocynum spp.*)	no
G-WET-40	River Section 2	1569130	734431	Rice Cut Grass (*Leersia oryzoides*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
				Broad leaved Arrowhead (*Sagittaria latifolia*)	no
G-WET-41	River Section 2	1574628	736877	Wild Rice (*Zizania aquatica*)	no
				Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
G-WET-42-UP	River Section 2	1574890	736942	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
G-WET-42-DN	River Section 2	1574773	736908	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
G-WET-43-UP	River Section 2	1576067	736951	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-43-DN	River Section 2	1575688	737049	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
G-WET-44	River Section 2	1576935	737990	Stiff Arrowhead (*Sagittaria rigida*)	no
G-WET-45-UP	River Section 2	1576179	738221	Wild Rice (*Zizania aquatica*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
				Stiff Arrowhead (*Sagittaria rigida*)	no
G-WET-45-DN	River Section 2	1573534	736991	Wild Rice (*Zizania aquatica*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
				Stiff Arrowhead (*Sagittaria rigida*)	no
G-WET-46	River Section 2	1574822	737719	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
G-WET-47-UP	River Section 2	1575225	737860	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Broad leaved Arrowhead (*Sagittaria latifolia*)	no
G-WET-47-DN	River Section 2	1574702	737695	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Broad leaved Arrowhead (*Sagittaria latifolia*)	no
G-WET-48	River Section 2	1566718	735875	Millet spp. (*Echinochloa spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-49-UP	River Section 2	1566368	736021	Cattail spp. (*Typha spp.*)	no
				Wool Grass (*Scirpus cyperinus*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Arrow Arum (*Peltandra virginica*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
G-WET-49-DN	River Section 2	1565859	736272	Cattail spp. (*Typha spp.*)	no
				Wool Grass (*Scirpus cyperinus*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Arrow Arum (*Peltandra virginica*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
G-WET-LL-1-1	River Section 2	1581976	735467	Jewel Weed spp. (*Impatiens spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				ButtonBush (*Cephalanthus occidentalis*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
G-WET-LL-1-2	River Section 2	1582726	735953	Jewel Weed spp. (*Impatiens spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				ButtonBush (*Cephalanthus occidentalis*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
G-WET-LL-1-3	River Section 2	1582846	735891	Jewel Weed spp. (*Impatiens spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				ButtonBush (*Cephalanthus occidentalis*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
G-WET-LL-1-4	River Section 2	1582558	735604	Jewel Weed spp. (*Impatiens spp.*)	no
				Rice Cut Grass (*Leersia oryzoides*)	no
				Reed Canary Grass (*Phalaris arundinacea*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				ButtonBush (*Cephalanthus occidentalis*)	no
				Bur-reed spp. (*Sparganium spp.*)	no

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates and Observed Species

Point ID	River Section	Northing	Easting	Species Observed	Invasive Species
G-WET-50-UP	River Section 3	1482928	710460	Arrow Arum (*Peltandra virginica*)	no
				Cattail spp. (*Typha spp.*)	no
G-WET-50-DN	River Section 3	1482270	710398	Arrow Arum (*Peltandra virginica*)	no
				Cattail spp. (*Typha spp.*)	no
G-WET-51	River Section 3	1483032	710501	Common Arrowhead (*Sagittaria latifolia*)	no
				Soft-stem Bullrush (*Scirpus validus*)	no
G-WET-52-UP	River Section 3	1483233	710576	Willow sp. (*Salix* sp.)	no
				Cattail spp. (*Typha spp.*)	no
G-WET-52-DN	River Section 3	1483137	710550	Willow sp. (*Salix* sp.)	no
				Cattail spp. (*Typha spp.*)	no
G-WET-53	River Section 3	1483460	711142	Soft-stem Bullrush (*Scirpus validus*)	no
G-WET-54-UP	River Section 3	1524035	734560	Wild Rice (*Zizania aquatica*)	no
G-WET-54-DN	River Section 3	1523096	734302	Wild Rice (*Zizania aquatica*)	no
G-WET-55-UP	River Section 3	1536733	736392	Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Wild Rice (*Zizania aquatica*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Arrow Arum (*Peltandra virginica*)	no
				Aster spp (*Bidens spp .)*	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-55-UP	River Section 3	1535093	736451	Joe Pye Weed spp. (*Eupatorium spp.*)	no
				Wild Rice (*Zizania aquatica*)	no
				Bur-reed spp. (*Sparganium spp.*)	no
				Purple Loosestrife (*Lythrum salicaria*)	yes
				Arrow Arum (*Peltandra virginica*)	no
				Aster spp (*Bidens spp .)*	no
				Spike Rush (*Eleocharis spp.*)	no
G-WET-56	River Section 3	1550914	738952	Purple Loosestrife (*Lythrum salicaria*)	yes

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates, Observed Species and Map Changes

Figure	Length (ft)	Comment
1-1	200	Extended aquatic bed north along shore
1-1	50	Moved deep edge of SAV bed towards river channel
1-1	50	Moved deep edge of SAV bed towards shore
1-1	25	Moved deep edge of SAV bed towards river channel
1-2	50	Moved deep edge of SAV bed towards river channel
1-4	75	Moved deep edge of SAV bed towards shore
1-7	N/A	Mapped as 1 separate beds, seperated into 2 beds
1-8	125	Moved deep edge of SAV bed towards shore
1-13	50	Moved deep edge of SAV bed towards shore
1-15	200	Moved deep edge of SAV bed towards shore
2-8	50	Extended aquatic bed around the top of the island
2-13	175	Moved deep edge of SAV bed towards river channel
3-2	25	Moved deep edge of SAV bed towards shore
3-2	N/A	Mapped as 1 separate beds, seperated into 2 beds
3-3	<50	Moved deep edge of SAV bed towards river channel
3-4	<50	Moved deep edge of SAV bed towards shore
3-5	100	Moved deep edge of SAV bed towards shore
3-6	100	Moved deep edge of SAV bed towards shore
3-7	75	Moved deep edge of SAV bed towards river channel
3-8	75	Moved deep edge of SAV bed towards shore
3-9	75	Moved deep edge of SAV bed towards shore
3-11	25	Moved deep edge of SAV bed towards shore
3-12	N/A	Mapped as 1 separate beds, seperated into 2 beds
3-13	50	Moved deep edge of SAV bed towards river channel
3-13	75	Moved deep edge of SAV bed towards shore
3-15	75	Moved deep edge of SAV bed towards shore
3-16	<50	Moved deep edge of SAV bed towards river channel
3-18	<50	Moved deep edge of SAV bed towards shore
3-19	N/A	Mapped as 1 separate beds, seperated into 2 beds
3-19	25	Moved deep edge of SAV bed towards shore
3-20	50	Moved deep edge of SAV bed towards shore
3-23	N/A	Mapped as 1 separate beds, seperated into 2 beds
3-24	N/A	Mapped as 1 separate beds, seperated into 2 beds
3-26	25	Moved deep edge of SAV bed towards shore
3-27	<50	Moved deep edge of SAV bed towards shore
3-27	N/A	Mapped as 1 separate beds, seperated into 2 beds
3-28	50	Moved deep edge of SAV bed towards shore
3-29	50	Moved deep edge of SAV bed towards shore
3-30	25	Moved deep edge of SAV bed towards shore
3-32	<50	Moved deep edge of SAV bed towards shore
3-33	<25	Moved deep edge of SAV bed towards shore
3-35	<100	Moved deep edge of SAV bed towards shore
3-37	<50	Moved deep edge of SAV bed towards shore
3-39	N/A	Mapped as 1 separate beds, seperated into 2 beds

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix A - Groundtruthing Locations in the Project Area:
Geographic Coordinates, Observed Species and Map Changes

Figure	Length (ft)	Comment
3-41	100	Moved deep edge of SAV bed towards shore
3-41	25	Moved deep edge of SAV bed towards shore
3-52	<100	Moved deep edge of SAV bed towards river channel
3-55	25	Moved deep edge of SAV bed towards shore
3-56	125	Moved deep edge of SAV bed towards shore
3-57	25	Moved deep edge of SAV bed towards shore
3-57	<50	Moved deep edge of SAV bed towards shore
3-57	50	Moved deep edge of SAV bed towards shore
3-58	<50	Moved deep edge of SAV bed towards shore
3-59	75	Moved deep edge of SAV bed towards shore
3-65	50	Moved deep edge of SAV bed towards shore
3-68	N/A	Interpreted as bed, no bed present during groundtruthing
3-69	N/A	Interpreted as bed, no bed present during groundtruthing
3-70	N/A	Interpreted as bed, no bed present during groundtruthing
3-71	N/A	Interpreted as bed, no bed present during groundtruthing
3-71	25	Moved deep edge of SAV bed towards shore
3-73	75	Moved deep edge of SAV bed towards shore
3-78	<100	Moved deep edge of SAV bed towards shore
3-80	N/A	Mapped as bed
3-83	75	Moved deep edge of SAV bed towards shore
3-85	50	Moved deep edge of SAV bed towards shore
3-86	50	Moved deep edge of SAV bed towards river channel
3-87	50	Moved deep edge of SAV bed towards river channel

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Appendix B

Aquatic Vegetation Bed, Riverine Fringing Wetland, and Shoreline Species Observed in Upper Hudson River

Appendix B – Aquatic Vegetation Bed, Riverine Fringing Wetland, and Shoreline Species Observed in Upper Hudson River

Common Name	Scientific Name	River Section	Source
AQUATIC BED			
Coontail	*Ceratophyllum demersum*	3	a, b
Common Waterweed	*Elodea canadensis*	1, 2, 3	a, b, c, d
Eurasian Water Milfoil	*Myriophyllum spicatum*	3	a, b
Yellow Floating Heart	*Nymphoides peltata*	3	a, b
Water Nymph	*Najas* spp.	1	a, c, d
White Water Lily	*Nymphaea odorata*	1, 2, 3	a, c, d
Curly Pondweed	*Potamogeton crispus*	1, 2, 3	a, c
Pondweed	*Potamogeton angustifolium*	1	d
Ribbon Leaf Pondweed	*Potamogeton epihydrous*	1, 2, 3	a, b, d
Grassy Pondweed	*Potamogeton gramineus*	1, 2, 3	a
American Pondweed	*Potamogeton nodosus*	1, 2	a
Redhead Grass	*Potamogeton perfoliatus*	1, 2, 3	a, b
Small Pondweed	*Potamogeton pusillus*	3	a
Richardson's Pondweed	*Potamogeton richardsonii*	1	a, d
Robbin's Pondweed	*Potamogeton robbinissi*	1	a, b, d
Water Chestnut	*Trapa natans*	1, 2, 3	a, b, c, d
Water Celery	*Vallisneria americana*	1, 2, 3	a, b, d
WETLAND			
Sweet Flag	*Acorus calamus*	1	a
Speckled Alder	*Alnus rugosa*	1	a
Aster spp	*Bidens spp.*	1, 3	a
Water shield	*Brasenia schreberi*	1, 3	b, d
Sedge spp.	*Carex spp.*	1	a
ButtonBush	*Cephalanthus occidentalis*	1, 2	a
Stonewort/Muskgrass	*Chara spp.*	3	b
White Turtle Head	*Chelone glabra*	1	a
Dogwood spp.	*Cornus spp.*	1	a
Millet spp.	*Echinochloa spp.*	2	a
Barnyard grass	*Echinochloa crusgalli*	3	b
Spike Rush spp.	*Eleocharis spp.*	2, 3	a
Boneset	*Eupatorium perfoliatum*	1	a
Joe Pye Weed spp.	*Eupatorium spp.*	1, 2	a
Black Ash	*Fraxinus nigra*	1	a
Yellow Sneezeweed	*Helenium autumnale*	1	a
Jewel Weed spp.	*Impatiens spp.*	1, 2	a
Yellow Flag	*Iris pseudacorus*	1	a
Rush spp.	*Juncus spp.*	1	a, b
Rice Cutgrass	*Leersia oryzoides*	1, 3	a
Duckweed	*Lemna minor*	1, 3	b
Cardinal Flower	*Lobelia cardinalis*	1	a
Purple Loosestrife	*Lythrum salicaria*	1, 2, 3	a
Ostrich Fern	*Matteuccia struthiopteris*	1	a
Winged Monkey Flower	*Mimulus alatus*	1	a
White Water Lilly	*Nymphaea odorata*	1, 2, 3	a, c
Sensitive Fern	*Onoclea sensibilis*	1	a
Royal Fern	*Osmunda regalis*	1	a
Arrow Arum	*Peltandra virginica*	1, 2, 3	a, d
Reed Canary Grass	*Phalaris arundinacea*	1, 2	a
Common Reed	*Phragmities australis*	1	a
Pickerel Weed	*Pontederia cordata*	1, 3	a, b

Appendix B – Aquatic Vegetation Bed, Riverine Fringing Wetland, and Shoreline Species Observed in Upper Hudson River

Common Name	Scientific Name	River Section	Source
Broad Leaved Arrowhead	*Sagittaria latifolia*	2, 3	a
Stiff Arrowhead	*Sagittaria rigida*	2, 3	a
Willow spp.	*Salix spp.*	1, 2	a
Wool Grass	*Scirpus cyperinus*	1, 2	a
Chairmakers Rush	*Scirpus pungens*	1	a
Soft-stem Bullrush	*Scirpus validus*	1, 2	a
Golden Rod spp.	*Solidago spp.*	1	a
Bur-reed spp.	*Sparganium spp.*	1, 2, 3	a
Cattail	*Typha latifolia*	1, 2, 3	a, b
Water-meal	*Wolffia* spp	3	b
Wild Rice	*Zizania aquatica*	2, 3	a
SHORELINE			
Box Elder	*Acer negundo*	3	a
Red Maple	*Acer rubra*	2, 3	a
Silver Maple	*Acer saccharinum*	1, 2, 3	a
Sugar Maple	*Acer saccharum*	2, 3	a
Speckled Alder	*Alnus rugosa*	1, 2, 3	a
Brown Ground Nut	*Apios americana*	1	a
Dogbane spp.	*Apocynum spp.*	3	a
Milkweed spp.	*Asclepias spp.*	3	a
Aster spp.	*Aster spp.*	1	a
Barberry spp.	*Berberis spp.*	3	a
Grey Birch	*Betula populifolia*	1, 3	a
Aster spp.	*Bidens spp.*	3	a
Wild Morning Glory	*Calystegia sepium*	1	a
Shagbark Hickory	*Carya ovata*	3	a
Northern Catalpa	*Catalpa speciosa*	1, 2, 3	a
Bittersweet spp.	*Celastrus spp.*	1	a
ButtonBush	*Cephalanthus occidentalis*	1, 3	a
Dogwood spp.	*Cornus spp.*	1, 2, 3	a
Queen Anne's Lace	*Daucus carota*	1	a
Three-way Sedge	*Dulichium arundinaceum*	3	a
White Snakeroot	*Eupatorium rugosum*	1	a
Joe Pye Weed spp.	*Eupatorium spp.*	1, 3	a
White Ash	*Fraxinus americana*	1, 3	a
Green Ash	*Fraxinus pennsylvanica*	2, 3	a
Yellow Sneezeweed	*Helenium autumnale*	1, 3	a
Woodland Sunflower	*Helianthus divaricatus*	1, 2	a
Cow Parsnip	*Heracleum lanatum*	1	a
Jewel Weed spp.	*Impatiens spp.*	1	a
Yellow Flag	*Iris pseudacorus*	1	a
Rice Cut Grass	*Leersia oryzoides*	3	a
Yellow Lilly	*Lilium canadense*	3	a
Cardinal Flower	*Lobelia cardinalis*	1	a
Tatarian Honeysuckle	*Lonicera tatarica*	1, 2, 3	a
Purple Loosestrife	*Lythrum salicaria*	1, 3	a
Apple spp.	*Malus spp.*	1	a
Mulberry spp.	*Morus spp.*	3	a
White Cow Lilly	*Nymphoides variegatum*	2	a
Sensitive Fern	*Onoclea sensibilis*	1	a
Virginia Creeper	*Parthenocissus quinqefolia*	1, 3	a

Appendix B – Aquatic Vegetation Bed, Riverine Fringing Wetland, and Shoreline Species Observed in Upper Hudson River

Common Name	Scientific Name	River Section	Source
White Pine	*Pinus strobus*	1, 2	a
Sycamore	*Platanus occidentalis*	3	a
Japanses Knot Weed	*Polygonum cuspidatum*	1	a
Pickerel Weed	*Pontederia cordata*	1, 2	a
Eastern Cottonwood	*Populus deltoides*	1, 2, 3	a
Quaking Aspen	*Populus tremuloides*	1, 2	a
White Oak	*Quercus alba*	2, 3	a
Bur Oak	*Quercus macrocarpa*	3	a
Chestnut Oak	*Quercus prinus*	1	a
Red Oak	*Quercus rubra*	1, 2, 3	a
Common Buckthorn	*Rhamnus cathartica*	1	a
Staghorn Sumac	*Rhus typhina*	1, 3	a
Black Locust	*Robinia pseudoacacia*	1, 3	a
Weeping Willow	*Salix babylonica*	1, 3	a
Crack Willow	*Salix fragilis*	3	a
Black Willow	*Salix nigra*	1, 2	a
Common Elderberry	*Sambucus canadensis*	1	a
Wool Grass	*Scirpus cyperinus*	2	a
Golden Rod spp.	*Solidago spp.*	1, 3	a
New York Fern	*Thelypteris noveboracensis*	1	a
Northern White Cedar	*Thuja occidentalis*	1	a
American Basswood	*Tilia americana*	1, 3	a
Cattail spp.	*Typha spp.*	1, 3	a
Elm spp.	*Ulmus spp.*	1, 2, 3	a
Common Mullen	*Verbascum thapsus*	1, 3	a
High Bush Cranberry	*Viburnum edule*	1	a
Wild Grape spp.	*Vitus spp.*	1, 3	a
Common Clotbur	*Xanthium chinense*	3	a

Sources:
a) Habitat delineation activities (BBL and Exponent, 2006)
b) Law Environmental, 1991. Law Environmental (1991) also reports observing *Sagittaria graminea* but do not specify the location.
c) EPA/Trustee Comments on HD Report (February 10, 2006)
d) Exponent, 1998. All observations are in River Section 1 only.

Note:
1. This list includes the species observed during limited field surveys and should not be considered an exhaustive list of species present in the Upper Hudson River.

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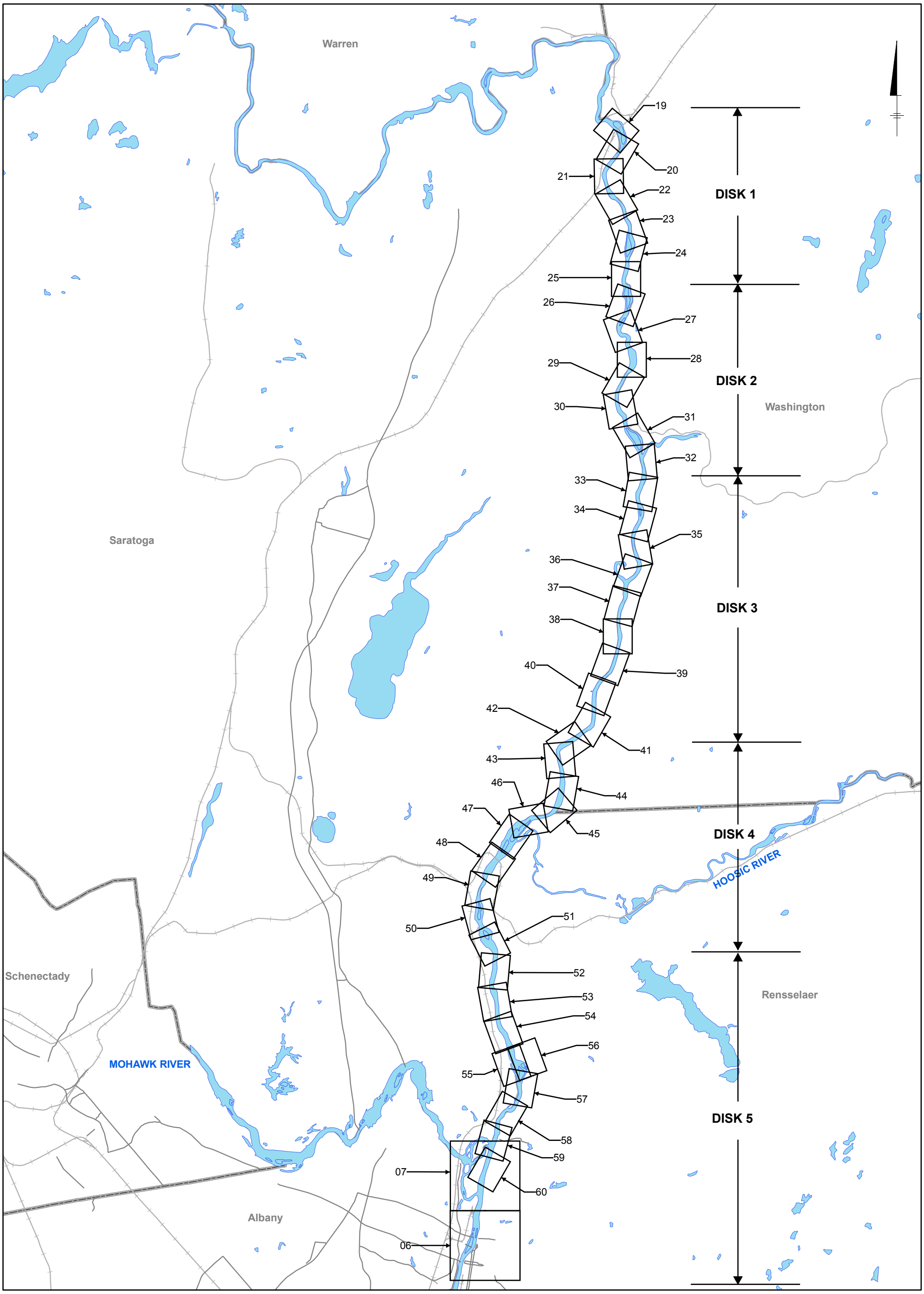
Appendix C

Maps of the In-River Habitats and Adjacent Land Use in the Project Area (separately bound)

SYR-85 MTK KEW
GE Hudson River (20409.0000.00005)
R:\GE_GIS\GE_HudsonRiver\HabDelineationReport\mxd\OrthoIndexGrid.mxd - 12/11/2008 @ 1:45:13 PM



NOTE:
1. HYDROGRAPHY DATA SET PROVIDED BY QEA.
2. ORTHOIMAGERY INDEX GRID PROVIDED BY SANBORN. IMAGES 06 AND 07 PROVIDED BY CHAS H. SELLS

0 3 6 Miles
GRAPHIC SCALE

LEGEND:
- ORTHOIMAGERY GRID INDEX
- 55 IMAGE NUMBER
- HYDROGRAPHY
- MAJOR ROADWAY
- RAILROAD
- COUNTY BOUNDARY

GENERAL ELECTRIC COMPANY
HUDSON RIVER PCBs SUPERFUND SITE
HABITAT DELINEATION REPORT
APPENDIX C - ARCREADER ELECTRONIC MAPS

ORTHOIMAGERY GRID INDEX

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FIGURE
1

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Appendix D

Groundtruthing Locations in Potential Off-Site Reference Areas: Geographic Coordinates and Observed Species

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix D - Groundtruthing Locations in Potential Off-Site Reference Areas: Geographic Coordinates and Observed Species

Station	Species	Stems	Length (cm)
MO-SAV-1	Va	3	109
MO-SAV-1	Va		116.2
MO-SAV-1	Va		157.6
MO-SAV-2	Va	16	173.2
MO-SAV-2	Va		151.8
MO-SAV-2	Va		203.4
MO-SAV-2	Va		178.7
MO-SAV-2	Va		183
MO-SAV-3	Va	3	26.2
MO-SAV-3	Va		46.6
MO-SAV-3	Va		42.8
MO-SAV-3	Pg	35	88.4
MO-SAV-3	Pg		84
MO-SAV-3	Pg		87.6
MO-SAV-3	Pg		75.4
MO-SAV-3	Pg		78.2
MO-SAV-4	Va	5	80.4
MO-SAV-4	Va		61.2
MO-SAV-4	Va		67.3
MO-SAV-4	Va		72.1
MO-SAV-4	Va		57.8
MO-SAV-5	Va	6	92.1
MO-SAV-5	Va		70.8
MO-SAV-5	Va		65.2
MO-SAV-5	Va		69.4
MO-SAV-5	Va		72.6
MO-SAV-6	Va	9	88.3
MO-SAV-6	Va		74.2
MO-SAV-6	Va		68.4
MO-SAV-6	Va		71.4
MO-SAV-6	Va		62.8
MO-SAV-7	Va	6	98.2
MO-SAV-7	Va		72.1
MO-SAV-7	Va		87.6
MO-SAV-7	Va		82.8
MO-SAV-7	Va		74.7

Notes:

1. When more than 5 stems were collected, 5 stems were randomly selected and measured.

General Electric Company
Hudson River PCBs Superfund Site
Habitat Delineation Report

Appendix D - Groundtruthing Locations in Potential Off-Site Reference Areas:
Geographic Coordinates and Observed Species

Point ID	Northing	Easting	Species Observed
G-SAV-UHREF-1	1621530	709088	Pondweed sp.(*Potamogeton* sp.)
			Sparganium sp.
G-SHO-UHREF-1	1615290	712728	None Recorded
G-SHO-UHREF-2	1622913	712667	None Recorded
G-UCB-UHREF-1	1620906	706411	None Recorded
G-WET-UHREF-1	1622055	709718	Spike Rush (*Eleocharis spp.*)
G-WET-UHREF-2	1623309	707259	Burreed, Arrowhead (*Sagittaria latifolia*)
G-WET-UHREF-3	1623458	711362	Bulrush (*Scripus validus*)
G-WET-UHREF-4	1618547	715656	Bur Reed (*Sparganium eurycarpum*), Bulrush (*Scripus validus*)
G-SAV-MO-1	1453471	701579	Wild Celery (*Vallisneria americana*)
			Wild Chestnut (*Trapa natans*)
			Eurasian Wild Milfoil (*Myriophyllum spicatum*)
G-SAV-MO-2	1442333	689924	Wild Celery (*Vallisneria americana*)
			Eurasian Wild Milfoil (*Myriophyllum spicatum*)
G-SAV-MO-3	1441201	688873	Wild Celery (*Vallisneria americana*)
			Pondweed sp.(*Potamogeton* sp.)
			Eurasian Wild Milfoil (*Myriophyllum spicatum*)
G-SAV-MO-4	1439055	680215	Wild Celery (*Vallisneria americana*)
			Pondweed sp.(*Potamogeton* sp.)
			Wild Chestnut (*Trapa natans*)
			Eurasian Wild Milfoil (*Myriophyllum spicatum*)
G-SAV-MO-5	1445091	669612	Wild Celery (*Vallisneria americana*)
			Eurasian Wild Milfoil (*Myriophyllum spicatum*)
G-SAV-MO-6	1441524	671980	Wild Celery (*Vallisneria americana*)
			Eurasian Wild Milfoil (*Myriophyllum spicatum*)
G-SAV-MO-7	1447683	694985	Wild Celery (*Vallisneria americana*)
			Eurasian Wild Milfoil (*Myriophyllum spicatum*)
G-SHO-MO-1	1440647	673089	None Recorded
G-SHO-MO-2	1440655	673068	None Recorded
G-SHO-MO-3	1443942	669346	None Recorded
G-SHO-MO-4	1442457	684823	None Recorded
G-SHO-MO-5	1442539	685964	None Recorded
G-UCB-MO-1	1446058	692585	None
G-UCB-MO-2	1444991	669528	None
G-UCB-MO-3	1437886	677716	None
G-UCB-MO-4	1447741	694980	None
G-UCB-MO-5	1452750	697132	None
G-WET-MO-1	1442457	684823	Cattail spp. (*Typha spp.*)

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Appendix E

Side-Scan Sonar Debris Survey
Code Descriptions

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-1	Troy Lock to Champlain Canal Lock 1	711450	1430342	C	Obstruction
2002	SS-2	Troy Lock to Champlain Canal Lock 1	711425	1435522	C	Submerged obstruction
2002	SS-3	Troy Lock to Champlain Canal Lock 1	713631	1440712	C	Relic bridge pier
2002	SS-4	Troy Lock to Champlain Canal Lock 1	714294	1442176	A	Log
2002	SS-5	Troy Lock to Champlain Canal Lock 1	714407	1443231	A	Block shaped target
2002	SS-6	Troy Lock to Champlain Canal Lock 1	714179	1443539	not determined	not determined
2002	SS-7	Troy Lock to Champlain Canal Lock 1	714224	1443869	B	Log
2002	SS-8	Troy Lock to Champlain Canal Lock 1	714360	1444160	not determined	not determined
2002	SS-9	Troy Lock to Champlain Canal Lock 1	714369	1444439	C	Cable or rope
2002	SS-10	Troy Lock to Champlain Canal Lock 1	714235	1444485	DA	Debris area, fallen trees, 100x15
2002	SS-11	Troy Lock to Champlain Canal Lock 1	714851	1444891	A	Round target
2002	SS-12	Troy Lock to Champlain Canal Lock 1	718254	1449439	DA	Debris area, logs, 90x60
2002	SS-13	Troy Lock to Champlain Canal Lock 1	718148	1449541	B	Tree
2002	SS-14	Troy Lock to Champlain Canal Lock 1	717592	1450438	DA	Debris area, logs, 165x125
2002	SS-15	Troy Lock to Champlain Canal Lock 1	717767	1451436	DA	Debris area, logs, 590x70
2002	SS-16	Troy Lock to Champlain Canal Lock 1	717675	1451467	C	Linear feature
2002	SS-17	Troy Lock to Champlain Canal Lock 1	717507	1451585	A	Oblong target
2002	SS-18	Troy Lock to Champlain Canal Lock 1	717385	1451809	B	Outfall
2002	SS-19	Troy Lock to Champlain Canal Lock 1	717389	1452096	C	Linear feature
2002	SS-20	Troy Lock to Champlain Canal Lock 1	717197	1452448	C	Water intake
2002	SS-21	Troy Lock to Champlain Canal Lock 1	717143	1452787	DA	Debris Area - 610x160
2002	SS-23	Troy Lock to Champlain Canal Lock 1	716870	1453371	B	Tree
2002	SS-22	Troy Lock to Champlain Canal Lock 1	716886	1453352	B	Oblong target
2002	SS-24	Troy Lock to Champlain Canal Lock 1	716677	1453415	B	Tree
2002	SS-25	Troy Lock to Champlain Canal Lock 1	716697	1453733	A	Oblong target
2002	SS-26	Champlain Canal Locks 1 to 2	716132	1458673	A	Log
2002	SS-27	Champlain Canal Locks 1 to 2	715627	1459092	A	Block shaped target
2002	SS-28	Champlain Canal Locks 1 to 2	715883	1459127	DA	Debris area, logs, 300x70
2002	SS-29	Champlain Canal Locks 1 to 2	715790	1459129	B	Oblong target
2002	SS-30	Champlain Canal Locks 1 to 2	715632	1459196	A	Oblong target
2002	SS-31	Champlain Canal Locks 1 to 2	715627	1459224	A	Oblong target
2002	SS-32	Champlain Canal Locks 1 to 2	715820	1459377	A	Linear feature
2002	SS-33	Champlain Canal Locks 1 to 2	715600	1459723	DA	Debris area, 215x60
2002	SS-34	Champlain Canal Locks 1 to 2	715337	1460145	DA	Debris area, fallen trees, 180x70
2002	SS-35	Champlain Canal Locks 1 to 2	714538	1461998	DA	Debris area, fallen trees, 610x50
2002	SS-36	Champlain Canal Locks 2 to 3	712382	1474618	B	Rock pile
2002	SS-37	Champlain Canal Locks 2 to 3	712432	1474803	B	Linear feature
2002	SS-38	Champlain Canal Locks 2 to 3	712189	1475121	C	Crib
2002	SS-39	Champlain Canal Locks 2 to 3	712091	1475211	B	Crib
2002	SS-40	Champlain Canal Locks 2 to 3	711970	1475277	B	Crib
2002	SS-41	Champlain Canal Locks 2 to 3	711874	1475380	C	Crib
2002	SS-44	Champlain Canal Locks 2 to 3	711566	1475659	C	Rock pile
2002	SS-43	Champlain Canal Locks 2 to 3	711658	1475549	C	Rock pile
2002	SS-42	Champlain Canal Locks 2 to 3	711766	1475469	B	Rock pile
2002	SS-45	Champlain Canal Locks 2 to 3	711452	1475737	B	Rock pile
2002	SS-46	Champlain Canal Locks 2 to 3	711607	1476096	B	Oblong target

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-47	Champlain Canal Locks 2 to 3	712568	1476814	B	Log
2002	SS-48	Champlain Canal Locks 2 to 3	710923	1477915	B	Linear feature
2002	SS-49	Champlain Canal Locks 2 to 3	711205	1480074	A	Tree
2002	SS-50	Champlain Canal Locks 2 to 3	711196	1480143	B	2-3 Trees
2002	SS-51	Champlain Canal Locks 2 to 3	711222	1480306	B	Tree
2002	SS-52	Champlain Canal Locks 2 to 3	711241	1480474	B	Tree
2002	SS-53	Champlain Canal Locks 3 to 4	712301	1487613	B	Tree?
2002	SS-54	Champlain Canal Locks 3 to 4	713416	1488132	B	Linear feature
2002	SS-55	Champlain Canal Locks 3 to 4	713534	1488373	B	Tree?
2002	SS-56	Champlain Canal Locks 3 to 4	713664	1489633	B	Linear feature
2002	SS-57	Champlain Canal Locks 3 to 4	713756	1489791	DA	Debris area, 45x30
2002	SS-58	Champlain Canal Locks 3 to 4	716338	1491772	B	Linear feature
2002	SS-59	Champlain Canal Locks 3 to 4	716267	1491912	B	Linear feature
2002	SS-60	Champlain Canal Locks 3 to 4	717707	1493594	C	Tree
2002	SS-61	Champlain Canal Locks 4 to 5	718642	1494634	A	Log
2002	SS-62	Champlain Canal Locks 4 to 5	718671	1494677	B	Oblong target
2002	SS-63	Champlain Canal Locks 4 to 5	718876	1494846	A	Small pile of rocks
2002	SS-64	Champlain Canal Locks 4 to 5	718824	1494903	A	Log
2002	SS-65	Champlain Canal Locks 4 to 5	718879	1494972	B	Log
2002	SS-66	Champlain Canal Locks 4 to 5	719929	1496137	A	Linear target
2002	SS-67	Champlain Canal Locks 4 to 5	719968	1496320	B	Linear target
2002	SS-68	Champlain Canal Locks 4 to 5	720297	1496523	DA	Debris Area, 110x70
2002	SS-69	Champlain Canal Locks 4 to 5	722860	1496965	B	Linear target
2002	SS-70	Champlain Canal Locks 4 to 5	720410	1497030	B	Oblong feature
2002	SS-71	Champlain Canal Locks 4 to 5	721465	1497039	C	Oblong feature
2002	SS-72	Champlain Canal Locks 4 to 5	723252	1497085	B	Linear target
2002	SS-73	Champlain Canal Locks 4 to 5	723128	1497154	B	Log
2002	SS-74	Champlain Canal Locks 4 to 5	723241	1497190	A	Log
2002	SS-75	Champlain Canal Locks 4 to 5	724106	1497737	B	Oblong feature
2002	SS-76	Champlain Canal Locks 4 to 5	723799	1497796	DA	Debris Area 350x150
2002	SS-77	Champlain Canal Locks 4 to 5	724150	1498001	B	Linear target
2002	SS-78	Champlain Canal Locks 4 to 5	724438	1498196	A	Log
2002	SS-79	Champlain Canal Locks 4 to 5	724439	1498390	A	Log sticking up, 3-4 ft
2002	SS-80	Champlain Canal Locks 4 to 5	724558	1498476	B	Log
2002	SS-82	Champlain Canal Locks 4 to 5	724591	1498544	C	Linear feature
2002	SS-81	Champlain Canal Locks 4 to 5	724604	1498529	A	Rock Pile
2002	SS-83	Champlain Canal Locks 4 to 5	724980	1498950	B	Log
2002	SS-84	Champlain Canal Locks 4 to 5	724509	1498989	B	Linear feature
2002	SS-85	Champlain Canal Locks 4 to 5	725139	1499375	B	Log
2002	SS-86	Champlain Canal Locks 4 to 5	724598	1499473	B	Log
2002	SS-87	Champlain Canal Locks 4 to 5	724339	1499643	C	3-4 Oblong objects
2002	SS-88	Champlain Canal Locks 4 to 5	725306	1499757	DA	Debris area, fallen trees, 300x50, located in NOAA charted spoil area
2002	SS-89	Champlain Canal Locks 4 to 5	724291	1499814	DA	Debris area, fallen trees, 3500x100
2002	SS-90	Champlain Canal Locks 4 to 5	725380	1500127	DA	Debris area, fallen trees, 270x70, located in NOAA charted spoil area
2002	SS-91	Champlain Canal Locks 4 to 5	724498	1500133	C	Linear feature
2002	SS-92	Champlain Canal Locks 4 to 5	725295	1500138	B	Log

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-93	Champlain Canal Locks 4 to 5	724965	1500712	A	Log
2002	SS-94	Champlain Canal Locks 4 to 5	725125	1500755	A	Log
2002	SS-95	Champlain Canal Locks 4 to 5	725466	1500952	C	Linear feature/Cable?
2002	SS-96	Champlain Canal Locks 4 to 5	725494	1501127	A	Log
2002	SS-97	Champlain Canal Locks 4 to 5	725606	1501272	DA	Debris area, 250x50
2002	SS-98	Champlain Canal Locks 4 to 5	725532	1501283	B	Log
2002	SS-99	Champlain Canal Locks 4 to 5	725035	1501426	A	Log
2002	SS-100	Champlain Canal Locks 4 to 5	725145	1501610	B	Log
2002	SS-101	Champlain Canal Locks 4 to 5	725600	1501611	A	Log
2002	SS-102	Champlain Canal Locks 4 to 5	725573	1502013	A	Oblong target
2002	SS-103	Champlain Canal Locks 4 to 5	725537	1502045	A	Log
2002	SS-104	Champlain Canal Locks 4 to 5	725361	1502732	B	Log
2002	SS-105	Champlain Canal Locks 4 to 5	725322	1502829	B	Log
2002	SS-106	Champlain Canal Locks 4 to 5	725592	1502896	C	Log
2002	SS-107	Champlain Canal Locks 4 to 5	725393	1502990	B	Linear feature
2002	SS-108	Champlain Canal Locks 4 to 5	725275	1503180	A	Small pile of rocks
2002	SS-109	Champlain Canal Locks 4 to 5	724969	1503350	DA	Debris area, fallen trees, 2000x50
2002	SS-110	Champlain Canal Locks 4 to 5	725255	1504277	A	Logs
2002	SS-111	Champlain Canal Locks 4 to 5	725257	1504407	B	Log
2002	SS-112	Champlain Canal Locks 4 to 5	725441	1504563	A	Log
2002	SS-113	Champlain Canal Locks 4 to 5	725095	1505308	B	Log
2002	SS-114	Champlain Canal Locks 4 to 5	725070	1505505	B	Tree
2002	SS-115	Champlain Canal Locks 4 to 5	725331	1505576	C	Linear feature
2002	SS-116	Champlain Canal Locks 4 to 5	725189	1505657	B	Linear feature - Dock?
2002	SS-117	Champlain Canal Locks 4 to 5	725054	1505673	B	Log
2002	SS-118	Champlain Canal Locks 4 to 5	725232	1505875	B	Linear feature
2002	SS-119	Champlain Canal Locks 4 to 5	725133	1505982	B	Log
2002	SS-120	Champlain Canal Locks 4 to 5	724979	1506151	B	Rock Pile
2002	SS-121	Champlain Canal Locks 4 to 5	725063	1506239	B	2 Logs
2002	SS-122	Champlain Canal Locks 4 to 5	725065	1506474	DA	Debris area, fallen trees, 240x50
2002	SS-123	Champlain Canal Locks 4 to 5	724946	1506553	C	4-5 Trees/logs
2002	SS-124	Champlain Canal Locks 4 to 5	724970	1506966	C	3-4 Trees/logs?
2002	SS-125	Champlain Canal Locks 4 to 5	724920	1507135	C	Linear feature
2002	SS-126	Champlain Canal Locks 4 to 5	724856	1507602	C	Linear feature
2002	SS-127	Champlain Canal Locks 4 to 5	724773	1507934	B	Log
2002	SS-128	Champlain Canal Locks 4 to 5	724810	1508015	C	1-2 Trees?
2002	SS-129	Champlain Canal Locks 4 to 5	724753	1509042	C	Tree
2002	SS-130	Champlain Canal Locks 4 to 5	724518	1509107	DA	Debris area, 210x60
2002	SS-131	Champlain Canal Locks 4 to 5	724659	1509116	B	Linear feature
2002	SS-132	Champlain Canal Locks 4 to 5	724778	1509214	B	Linear feature
2002	SS-133	Champlain Canal Locks 4 to 5	726252	1510036	B	Linear feature/Log?
2002	SS-134	Champlain Canal Locks 4 to 5	726998	1510575	DA	Debris area, logs, 180x110
2002	SS-135	Champlain Canal Locks 4 to 5	727396	1510771	DA	Debris area, logs, 220x135
2002	SS-136	Champlain Canal Locks 4 to 5	731014	1516284	C	Log
2002	SS-137	Champlain Canal Locks 4 to 5	731112	1516418	B	Log
2002	SS-138	Champlain Canal Locks 4 to 5	731086	1517431	B	Log

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-139	Champlain Canal Locks 4 to 5	733540	1522462	DA	Debris area, fallen trees, 500x30
2002	SS-140	Champlain Canal Locks 4 to 5	734572	1524700	A	Log
2002	SS-141	Champlain Canal Locks 4 to 5	734594	1524766	B	Log
2002	SS-142	Champlain Canal Locks 4 to 5	734759	1525580	DA	Debris area, 130x50
2002	SS-143	Champlain Canal Locks 4 to 5	734572	1526102	C	Dock?
2002	SS-144	Champlain Canal Locks 4 to 5	734605	1526156	C	Tree
2002	SS-145	Champlain Canal Locks 4 to 5	735169	1526480	DA	Debris area, fallen trees, 660x50
2002	SS-146	Champlain Canal Locks 4 to 5	734897	1526784	B	Rock pile
2002	SS-147	Champlain Canal Locks 4 to 5	734753	1526844	C	Tree
2002	SS-148	Champlain Canal Locks 4 to 5	734788	1526995	B	Tree
2002	SS-149	Champlain Canal Locks 4 to 5	734895	1527272	DA	Debris area, logs, 135x60
2002	SS-150	Champlain Canal Locks 4 to 5	735394	1527522	DA	Debris area, 480x120
2002	SS-151	Champlain Canal Locks 4 to 5	735561	1527767	B	2-3 Logs
2002	SS-152	Champlain Canal Locks 4 to 5	735018	1528074	DA	Debris area, fallen trees, 780x90
2002	SS-153	Champlain Canal Locks 4 to 5	735368	1528146	C	Tree?
2002	SS-154	Champlain Canal Locks 4 to 5	734750	1530880	DA	Debris area, fallen trees
2002	SS-155	Champlain Canal Locks 4 to 5	734862	1532148	DA	Debris area, logs, 60x20
2002	SS-156	Champlain Canal Locks 4 to 5	734899	1532365	A	Small object, 2-3' tall
2002	SS-157	Champlain Canal Locks 4 to 5	734996	1532416	B	Oblong feature
2002	SS-158	Champlain Canal Locks 4 to 5	735048	1532634	C	Linear feature
2002	SS-159	Champlain Canal Locks 4 to 5	735044	1532741	A	Oblong target, 1-2' tall
2002	SS-160	Champlain Canal Locks 4 to 5	734957	1532874	C	Tree
2002	SS-161	Champlain Canal Locks 4 to 5	735727	1533096	C	Feature extending 10' off bottom
2002	SS-162	Champlain Canal Locks 4 to 5	735891	1533873	DA	Debris area, fallen trees, 280x180
2002	SS-163	Champlain Canal Locks 4 to 5	736135	1534423	DA	Debris area, fallen trees, 330x90
2002	SS-164	Champlain Canal Locks 4 to 5	735987	1534879	DA	Debris area, fallen trees, 200x70
2002	SS-165	Champlain Canal Locks 4 to 5	736239	1535149	A	Oblong target, 1-2' tall
2002	SS-166	Champlain Canal Locks 4 to 5	735954	1535242	DA	Debris area, fallen trees, 180x70
2002	SS-167	Champlain Canal Locks 4 to 5	735905	1535836	DA	Debris area, fallen trees, 930x120
2002	SS-168	Champlain Canal Locks 4 to 5	736178	1536967	not determined	fallen trees
2002	SS-169	Champlain Canal Locks 4 to 5	736440	1537070	C	Tree?
2002	SS-170	Champlain Canal Locks 4 to 5	736523	1537225	A	Log
2002	SS-171	Champlain Canal Locks 4 to 5	736468	1537265	A	Oblong target, 1-2' tall
2002	SS-172	Champlain Canal Locks 4 to 5	736507	1537347	C	Linear feature
2002	SS-173	Champlain Canal Locks 4 to 5	736327	1537516	B	Linear feature, cable?
2002	SS-174	Champlain Canal Locks 4 to 5	736895	1537553	C	Linear feature
2002	SS-175	Champlain Canal Locks 4 to 5	736394	1537557	B	Linear feature, log?
2002	SS-176	Champlain Canal Locks 4 to 5	736804	1537619	DA	Debris area, logs, 520x180
2002	SS-177	Champlain Canal Locks 4 to 5	737128	1537763	C	2 Logs
2002	SS-178	Champlain Canal Locks 4 to 5	737074	1537827	DA	Debris area, 120x70
2002	SS-179	Champlain Canal Locks 4 to 5	736363	1537835	C	Tree?
2002	SS-180	Champlain Canal Locks 4 to 5	736998	1537969	B	Oblong target
2002	SS-181	Champlain Canal Locks 4 to 5	737397	1538042	DA	Debris area, logs, 200x50
2002	SS-182	Champlain Canal Locks 4 to 5	737686	1538250	DA	Debris area, logs, 400x150
2002	SS-183	Champlain Canal Locks 4 to 5	737310	1538252	DA	Debris area, 100x65
2002	SS-184	Champlain Canal Locks 4 to 5	737233	1538379	DA	Debris area, fallen trees, 300x55

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-185	Champlain Canal Locks 4 to 5	737541	1538410	DA	Debris area, 210x100
2002	SS-186	Champlain Canal Locks 4 to 5	737695	1538563	DA	Debris area, 125x100
2002	SS-187	Champlain Canal Locks 4 to 5	737850	1538629	C	Linear feature, cable?
2002	SS-188	Champlain Canal Locks 4 to 5	737710	1538717	C	Tree
2002	SS-189	Champlain Canal Locks 4 to 5	737964	1538868	DA	Debris area, logs, 280x110
2002	SS-190	Champlain Canal Locks 4 to 5	738329	1539101	DA	Debris area, fallen trees, 1250x130
2002	SS-191	Champlain Canal Locks 4 to 5	738205	1539324	DA	Debris area, 140x30
2002	SS-192	Champlain Canal Locks 4 to 5	738259	1539548	C	Log
2002	SS-193	Champlain Canal Locks 4 to 5	738191	1539604	DA	Debris area, fallen trees, 430x35
2002	SS-194	Champlain Canal Locks 4 to 5	738738	1539791	DA	Debris area, fallen trees, 170x70
2002	SS-195	Champlain Canal Locks 4 to 5	738228	1539923	DA	Debris area, fallen trees, 100x50
2002	SS-196	Champlain Canal Locks 4 to 5	738303	1540347	B	Log
2002	SS-197	Champlain Canal Locks 4 to 5	738294	1540517	DA	Debris area, fallen trees, 250x50
2002	SS-198	Champlain Canal Locks 4 to 5	738996	1540640	DA	Debris area, logs, 120x45
2002	SS-199	Champlain Canal Locks 4 to 5	738686	1540817	B	Log
2002	SS-200	Champlain Canal Locks 4 to 5	738035	1541472	DA	Debris area, fallen trees, 260x90
2002	SS-201	Champlain Canal Locks 4 to 5	738363	1541730	C	Linear feature, log?
2002	SS-202	Champlain Canal Locks 4 to 5	737625	1542622	DA	Debris area, fallen trees, 90x50
2002	SS-203	Champlain Canal Locks 4 to 5	737331	1544442	DA	Debris area, fallen trees, 130x50
2002	SS-204	Champlain Canal Locks 4 to 5	737551	1545988	DA	Debris area, 170x90
2002	SS-205	Champlain Canal Locks 4 to 5	737428	1546018	C	Linear feature, cable?
2002	SS-206	Champlain Canal Locks 4 to 5	737442	1546154	C	Log
2002	SS-207	Champlain Canal Locks 4 to 5	737848	1546156	B	Log
2002	SS-208	Champlain Canal Locks 4 to 5	737670	1546198	DA	Debris area, 130x120
2002	SS-209	Champlain Canal Locks 4 to 5	737750	1546357	C	Log
2002	SS-210	Champlain Canal Locks 4 to 5	737986	1546371	C	Linear feature
2002	SS-211	Champlain Canal Locks 4 to 5	737789	1546539	B	Log
2002	SS-212	Champlain Canal Locks 4 to 5	737976	1546643	B	Linear feature/Log?
2002	SS-213	Champlain Canal Locks 4 to 5	737579	1546703	B	Tree?
2002	SS-214	Champlain Canal Locks 4 to 5	738177	1547121	DA	Debris area, logs, 200x100
2002	SS-215	Champlain Canal Locks 4 to 5	737781	1547126	DA	Debris area, fallen trees, 530x40
2002	SS-216	Champlain Canal Locks 4 to 5	738294	1547260	C	Linear feature
2002	SS-217	Champlain Canal Locks 4 to 5	738142	1547664	DA	Debris area, fallen trees, 230x50
2002	SS-218	Champlain Canal Locks 4 to 5	738728	1548469	DA	Debris area, 160x70
2002	SS-219	Champlain Canal Locks 4 to 5	738868	1548905	DA	Debris area, 220x50
2002	SS-220	Champlain Canal Locks 4 to 5	738922	1550838	DA	Debris area, fallen trees, 1400x80
2002	SS-221	Champlain Canal Locks 4 to 5	739609	1555049	DA	Debris area, fallen trees, 80x80
2002	SS-222	Champlain Canal Locks 4 to 5	739359	1557756	DA	Debris area, fallen trees, 970x50
2002	SS-223	Thompson Island Dam to Fort Edward	736336	1588598	A	2-3 logs
2002	SS-225	Thompson Island Dam to Fort Edward	736599	1590158	B	2-3 Oblong objects
2002	SS-226	Thompson Island Dam to Fort Edward	735758	1590186	DA	Debris area, logs, 120x50, located in area where NOAA charts a shipwreck
2002	SS-227	Thompson Island Dam to Fort Edward	736353	1590506	DA	Debris area, logs, 450x35
2002	SS-228	Thompson Island Dam to Fort Edward	735830	1590539	DA	Debris area, logs, 150x60
2002	SS-229	Thompson Island Dam to Fort Edward	736310	1590915	DA	Debris area, logs, 180x25
2002	SS-230	Thompson Island Dam to Fort Edward	736525	1590988	C	Cable
2002	SS-231	Thompson Island Dam to Fort Edward	736474	1591088	B	2 Objects; 1-tall, 1-long

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-232	Thompson Island Dam to Fort Edward	736343	1591141	B	Linear feature/Log?
2002	SS-233	Thompson Island Dam to Fort Edward	736222	1591303	B	2-3 Linear features
2002	SS-234	Thompson Island Dam to Fort Edward	736731	1591645	B	2-3 logs
2002	SS-236	Thompson Island Dam to Fort Edward	736835	1591863	B	Log
2002	SS-237	Thompson Island Dam to Fort Edward	736315	1591969	DA	Debris area, 570x140
2002	SS-238	Thompson Island Dam to Fort Edward	736812	1591971	B	Log
2002	SS-235	Thompson Island Dam to Fort Edward	736604	1591801	DA	Debris area, 750x200
2002	SS-239	Thompson Island Dam to Fort Edward	736789	1592334	B	Log
2002	SS-240	Thompson Island Dam to Fort Edward	736791	1592391	B	Log
2002	SS-241	Thompson Island Dam to Fort Edward	736570	1592426	C	Tree
2002	SS-242	Thompson Island Dam to Fort Edward	736407	1592635	DA	Debris area, 650x170
2002	SS-243	Thompson Island Dam to Fort Edward	736247	1592967	B	2-3 Logs
2002	SS-244	Thompson Island Dam to Fort Edward	736517	1593104	C	Linear feature
2002	SS-245	Thompson Island Dam to Fort Edward	736274	1593499	A	Oblong object
2002	SS-246	Thompson Island Dam to Fort Edward	735986	1594068	DA	Debris area, 2 Logs, 110x25
2002	SS-247	Thompson Island Dam to Fort Edward	736991	1594149	DA	Debris area, 1300x120
2002	SS-248	Thompson Island Dam to Fort Edward	737579	1594980	DA	Debris area, logs, 260x80
2002	SS-249	Thompson Island Dam to Fort Edward	737897	1595173	B	Log
2002	SS-250	Thompson Island Dam to Fort Edward	737694	1595190	B	Log
2002	SS-251	Thompson Island Dam to Fort Edward	737941	1595475	DA	Debris area, logs, 220x50
2002	SS-252	Thompson Island Dam to Fort Edward	737282	1595695	DA	Debris area, 1060x70
2002	SS-253	Thompson Island Dam to Fort Edward	737493	1595720	B	2-3 logs
2002	SS-254	Thompson Island Dam to Fort Edward	736216	1596324	DA	Debris area, 2 Logs, 85x15
2002	SS-255	Thompson Island Dam to Fort Edward	737617	1596470	B	Log
2002	SS-256	Thompson Island Dam to Fort Edward	737521	1596614	A	Log
2002	SS-257	Thompson Island Dam to Fort Edward	737332	1596623	C	Log
2002	SS-258	Thompson Island Dam to Fort Edward	736307	1596699	C	Linear feature/Cable?
2002	SS-259	Thompson Island Dam to Fort Edward	737371	1596828	B	2-3 logs
2002	SS-260	Thompson Island Dam to Fort Edward	737027	1598377	DA	Debris area, 100x50
2002	SS-261	Thompson Island Dam to Fort Edward	736770	1598421	DA	Debris area, logs, 920x80
2002	SS-262	Thompson Island Dam to Fort Edward	736924	1599322	DA	Debris area, 205x85
2002	SS-263	Thompson Island Dam to Fort Edward	736393	1599471	DA	Debris area, 400x280
2002	SS-264	Thompson Island Dam to Fort Edward	736231	1599779	B	2 Logs
2002	SS-265	Thompson Island Dam to Fort Edward	736118	1599893	B	2 Linear features
2002	SS-266	Thompson Island Dam to Fort Edward	736519	1599981	DA	Debris area, 560x160, located in NOAA charted spoil area
2002	SS-267	Thompson Island Dam to Fort Edward	736132	1601025	C	Log
2002	SS-268	Thompson Island Dam to Fort Edward	736282	1601239	B	Rock pile
2002	SS-269	Thompson Island Dam to Fort Edward	735962	1601333	B	2 Logs
2002	SS-270	Thompson Island Dam to Fort Edward	736102	1601627	DA	Debris area, 220x85
2002	SS-271	Thompson Island Dam to Fort Edward	735969	1602082	DA	Debris area, 600x210
2002	SS-272	Thompson Island Dam to Fort Edward	735557	1602315	DA	Debris area, 150x130
2002	SS-273	Thompson Island Dam to Fort Edward	735787	1602333	B	Log
2002	SS-274	Thompson Island Dam to Fort Edward	735715	1602436	B	Log
2002	SS-275	Thompson Island Dam to Fort Edward	735651	1602629	C	Linear feature
2002	SS-276	Thompson Island Dam to Fort Edward	735065	1602873	C	Linear feature/Cable?
2002	SS-277	Thompson Island Dam to Fort Edward	735480	1602918	A	Oblong object

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-278	Thompson Island Dam to Fort Edward	734946	1603038	DA	Debris area, logs, 200x110
2002	SS-279	Thompson Island Dam to Fort Edward	734978	1603203	DA	Debris area, 100x80
2002	SS-280	Thompson Island Dam to Fort Edward	734645	1603406	B	Linear feature/Log?
2002	SS-282	Thompson Island Dam to Fort Edward	734617	1603501	A	2-3 Logs
2002	SS-283	Thompson Island Dam to Fort Edward	734510	1603595	A	2 Tall objects
2002	SS-284	Thompson Island Dam to Fort Edward	734111	1603599	B	Linear feature/Log?
2002	SS-285	Thompson Island Dam to Fort Edward	734753	1603699	B	Tree
2002	SS-287	Thompson Island Dam to Fort Edward	734587	1603877	DA	Debris area, 890x90
2002	SS-286	Thompson Island Dam to Fort Edward	734221	1603800	DA	Debris area, 300x50
2002	SS-288	Thompson Island Dam to Fort Edward	733972	1603917	DA	Debris area, 85x55
2002	SS-289	Thompson Island Dam to Fort Edward	733375	1603985	DA	Debris area, 1230x120
2002	SS-290	Thompson Island Dam to Fort Edward	734004	1604251	DA	Debris area, 190x50
2002	SS-291	Thompson Island Dam to Fort Edward	734078	1604546	B	2-3 Linear features
2002	SS-292	Thompson Island Dam to Fort Edward	733931	1604581	B	Logs
2002	SS-293	Thompson Island Dam to Fort Edward	732819	1605460	DA	Debris area, 600x70
2002	SS-294	Thompson Island Dam to Fort Edward	733219	1605668	DA	Debris area, logs, 930x160
2002	SS-295	Thompson Island Dam to Fort Edward	732868	1605776	B	Linear feature/Log?
2002	SS-296	Thompson Island Dam to Fort Edward	733069	1606369	DA	Debris area, 170x110
2002	SS-297	Thompson Island Dam to Fort Edward	732940	1606592	C	Linear feature/Log?
2002	SS-298	Thompson Island Dam to Fort Edward	732801	1606617	A	3-4 Linear features
2002	SS-299	Thompson Island Dam to Fort Edward	732645	1607320	A	3-4 Linear features
2002	SS-300	Thompson Island Dam to Fort Edward	732783	1607845	B	Linear feature/Log?
2002	SS-301	Thompson Island Dam to Fort Edward	732930	1608654	A	3-4 Linear features
2002	SS-302	Thompson Island Dam to Fort Edward	733213	1608782	C	Linear feature/Cable?
2002	SS-303	Thompson Island Dam to Fort Edward	733439	1609447	A	2 Linear features
2002	SS-304	Thompson Island Dam to Fort Edward	733825	1609536	DA	Debris area, 3500x85
2002	SS-305	Thompson Island Dam to Fort Edward	733681	1609791	A	1 Linear feature
2002	SS-306	Thompson Island Dam to Fort Edward	734304	1610907	DA	Debris area, fallen trees, 560x60, located in NOAA charted spoil area
2002	SS-307	Thompson Island Dam to Fort Edward	734624	1610922	B	2 Linear features - logs?
2002	SS-308	Thompson Island Dam to Fort Edward	734928	1611097	B	3-4 Objects, 2-3 ft tall
2002	SS-309	Thompson Island Dam to Fort Edward	735162	1611566	DA	Debris area, 290x60
2002	SS-310	Thompson Island Dam to Fort Edward	735067	1611779	DA	Debris area, logs, 1040x110, located in NOAA charted spoil area
2002	SS-311	Thompson Island Dam to Fort Edward	735367	1611954	A	3-4 Oblong objects
2002	SS-312	Thompson Island Dam to Fort Edward	735731	1612548	C	Linear feature/Cable?
2002	SS-313	Thompson Island Dam to Fort Edward	735346	1612608	DA	Debris area, 335x60
2002	SS-314	Thompson Island Dam to Fort Edward	735935	1612824	DA	Debris area, 230x100
2002	SS-315	Thompson Island Dam to Fort Edward	735469	1612900	DA	Debris area, 210x130
2002	SS-316	Thompson Island Dam to Fort Edward	735272	1613082	DA	Debris area, 100x70
2002	SS-317	Thompson Island Dam to Fort Edward	735541	1613088	DA	Debris area, 150x75
2002	SS-318	Thompson Island Dam to Fort Edward	736122	1613094	DA	Debris area, 240x80
2002	SS-319	Thompson Island Dam to Fort Edward	735596	1613186	C	Possible barge/shipwreck, located near NOAA charted wreck location
2002	SS-320	Thompson Island Dam to Fort Edward	736177	1613394	DA	Debris area, logs, 210x35
2002	SS-321	Thompson Island Dam to Fort Edward	736389	1613628	DA	Debris area, 600x130
2002	SS-322	Thompson Island Dam to Fort Edward	735489	1613798	DA	Debris area, 700x130
2002	SS-323	Thompson Island Dam to Fort Edward	736203	1613808	DA	Debris area, 410x35
2002	SS-324	Thompson Island Dam to Fort Edward	734986	1614299	DA	Debris area, logs, 400x60

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2002	SS-325	Thompson Island Dam to Fort Edward	736058	1614614	DA	Debris area, 325x50
2002	SS-326	Thompson Island Dam to Fort Edward	734940	1614800	DA	Debris area, fallen trees, 440x65
2002	SS-327	Thompson Island Dam to Fort Edward	735851	1615297	C	3 Trees along shore
2002	SS-328	Thompson Island Dam to Fort Edward	735753	1615583	B	2-3 Trees along shore
2002	SS-329	Thompson Island Dam to Fort Edward	734312	1615675	DA	Debris area, 100x50
2002	SS-330	Thompson Island Dam to Fort Edward	734950	1616954	DA	Debris area, 128x80
2002	SS-331	Champlain Canal Locks 4 to 5	738505	1552157	DA	Debris area, 300x40
2002	SS-332	Thompson Island Dam to Fort Edward	736138	1600421	C	Possible shipwreck, located in rocky area near NOAA charted wreck location
2003	SS-462	Champlain Canal Locks 5 to 6	737978	1576172	A	Log?
2003	SS-429	Champlain Canal Locks 5 to 6	734867	1568371	B	Relic crib?
2003	SS-623	Champlain Canal Locks 5 to 6	734787	1568585	B	Isolated feature
2003	SS-431	Champlain Canal Locks 5 to 6	734782	1568767	C	Relic crib?
2003	SS-432	Champlain Canal Locks 5 to 6	734793	1568963	B	Relic crib?
2003	SS-433	Champlain Canal Locks 5 to 6	734891	1569374	C	Relic crib?
2003	SS-434	Champlain Canal Locks 5 to 6	735025	1570058	B	Linear feature
2003	SS-435	Champlain Canal Locks 5 to 6	735344	1571036	C	Tree
2003	SS-437	Champlain Canal Locks 5 to 6	737356	1575268	B	Linear feature
2003	SS-438	Champlain Canal Locks 5 to 6	737570	1575756	B	2-3 linear features
2003	SS-440	Champlain Canal Locks 5 to 6	737068	1573516	B	Linear feature
2003	SS-441	Champlain Canal Locks 5 to 6	737527	1574323	A	Linear feature
2003	SS-442	Champlain Canal Locks 5 to 6	737483	1574341	A	Linear feature
2003	SS-458	Champlain Canal Locks 5 to 6	737620	1574608	B	Log?
2003	SS-444	Champlain Canal Locks 5 to 6	737687	1574837	A	Linear feature
2003	SS-445	Champlain Canal Locks 5 to 6	737637	1574976	B	2 linear features
2003	SS-446	Champlain Canal Locks 5 to 6	737716	1575163	B	2 linear features
2003	SS-447	Champlain Canal Locks 5 to 6	737704	1575807	B	Tree
2003	SS-448	Champlain Canal Locks 5 to 6	737602	1576065	B	Linear feature
2003	SS-449	Champlain Canal Locks 5 to 6	737567	1576278	A	Oblong feature
2003	SS-450	Champlain Canal Locks 5 to 6	737679	1576331	A	Oblong feature
2003	SS-451	Champlain Canal Locks 5 to 6	737751	1576566	A	Linear feature
2003	SS-452	Champlain Canal Locks 5 to 6	737863	1576368	B	Oblong feature
2003	SS-453	Champlain Canal Locks 5 to 6	737892	1575628	A	Stump
2003	SS-454	Champlain Canal Locks 5 to 6	737876	1574962	A	Linear feature
2003	SS-455	Champlain Canal Locks 5 to 6	737929	1574933	A	Linear feature
2003	SS-456	Champlain Canal Locks 5 to 6	737765	1574685	A	Log?
2003	SS-457	Champlain Canal Locks 5 to 6	737691	1574599	B	Tree
2003	SS-443	Champlain Canal Locks 5 to 6	737614	1574593	B	Linear feature
2003	SS-459	Champlain Canal Locks 5 to 6	737546	1574303	A	Linear feature
2003	SS-460	Champlain Canal Locks 5 to 6	737430	1573785	A	Linear feature
2003	SS-461	Champlain Canal Locks 5 to 6	738098	1575864	B	Linear feature-dock?
2003	SS-463	Champlain Canal Locks 5 to 6	738056	1576398	A	Stump?
2003	SS-464	Champlain Canal Locks 5 to 6	737752	1576632	A	Linear feature
2003	SS-465	Lock 6 Land Cut	737621	1577604	A	Log?
2003	SS-466	Champlain Canal Locks 5 to 6	737643	1577422	A	Log?
2003	SS-468	Champlain Canal Locks 5 to 6	737793	1577125	A	Log?
2003	SS-469	Champlain Canal Locks 5 to 6	737844	1576757	A	Linear feature

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2003	SS-472	Champlain Canal Locks 5 to 6	738155	1575910	A	Oblong feature
2003	SS-473	Champlain Canal Locks 5 to 6	738241	1575807	A	Dock
2003	SS-474	Champlain Canal Locks 5 to 6	734920	1568207	B	Crib?
2003	SS-475	Champlain Canal Locks 5 to 6	735066	1567652	B	Crib?
2003	SS-476	Champlain Canal Locks 5 to 6	735124	1567394	A	Linear feature
2003	SS-477	Champlain Canal Locks 5 to 6	735201	1567375	B	Linear feature
2003	SS-478	Champlain Canal Locks 5 to 6	735335	1567039	B	Linear feature
2003	SS-479	Champlain Canal Locks 5 to 6	735440	1567013	B	Linear feature
2003	SS-480	Champlain Canal Locks 5 to 6	735250	1567619	A	3-4 small features
2003	SS-481	Champlain Canal Locks 5 to 6	735440	1567360	B	Linear feature
2003	SS-482	Champlain Canal Locks 5 to 6	735261	1567264	B	Linear feature
2003	SS-483	Champlain Canal Locks 5 to 6	735395	1567199	A	Linear feature
2003	SS-484	Champlain Canal Locks 5 to 6	736344	1565205	A	Linear feature
2003	SS-485	Champlain Canal Locks 5 to 6	736418	1565452	B	Crib?
2003	SS-487	Champlain Canal Locks 5 to 6	736326	1565762	B	Linear feature
2003	SS-488	Champlain Canal Locks 5 to 6	736256	1566203	A	Linear feature
2003	SS-489	Lock 6 Land Cut	737619	1581576	B	Linear feature
2003	SS-490	Lock 6 Land Cut	737636	1581872	B	Tree?
2003	SS-491	Lock 6 Land Cut	737604	1582211	B	Log?
2003	SS-492	Lock 6 Land Cut	737674	1582817	C	2 linear features
2003	SS-493	Lock 6 Land Cut	737666	1584788	A	Linear feature
2002	SS-224	Lock 6 Land Cut	737065	1588963	not determined	not determined
2003	SS-495	Lock 6 Land Cut	737010	1589120	A	Tire?
2003	SS-496	Lock 6 Land Cut	737388	1587498	A	Linear feature
2003	SS-497	Lock 6 Land Cut	737422	1587321	A	Linear feature
2003	SS-498	Lock 6 Land Cut	737448	1587127	A	Linear feature
2003	SS-499	Lock 6 Land Cut	737607	1586218	A	Linear feature
2003	SS-500	Fort Miller Dam to Thompson Island Dam	735824	1583396	A	Linear feature
2003	SS-501	Fort Miller Dam to Thompson Island Dam	735976	1583689	A	Tree?
2003	SS-502	Fort Miller Dam to Thompson Island Dam	735943	1583895	A	Log?
2003	SS-503	Fort Miller Dam to Thompson Island Dam	735976	1583986	A	2 linear features
2003	SS-504	Fort Miller Dam to Thompson Island Dam	736105	1584227	A	Linear feature
2003	SS-505	Fort Miller Dam to Thompson Island Dam	736028	1584414	A	Linear feature
2003	SS-506	Fort Miller Dam to Thompson Island Dam	736053	1584455	A	2 linear features
2003	SS-507	Fort Miller Dam to Thompson Island Dam	736067	1584537	B	Linear feature
2003	SS-509	Fort Miller Dam to Thompson Island Dam	736100	1584960	B	Tree?
2003	SS-584	Fort Miller Dam to Thompson Island Dam	736206	1585460	A	Log?
2003	SS-513	Fort Miller Dam to Thompson Island Dam	736187	1586088	B	Tree?
2003	SS-514	Fort Miller Dam to Thompson Island Dam	736096	1586322	A	Linear feature
2003	SS-515	Fort Miller Dam to Thompson Island Dam	736299	1584148	B	Linear feature
2003	SS-517	Fort Miller Dam to Thompson Island Dam	736301	1584814	B	Tree?
2003	SS-518	Fort Miller Dam to Thompson Island Dam	736364	1585019	B	Linear feature
2003	SS-519	Fort Miller Dam to Thompson Island Dam	736363	1586454	B	Linear feature
2003	SS-520	Fort Miller Dam to Thompson Island Dam	736187	1586717	A	Linear feature
2003	SS-522	Fort Miller Dam to Thompson Island Dam	736724	1584817	B	Linear feature
2003	SS-523	Fort Miller Dam to Thompson Island Dam	736961	1585395	A	Oblong feature

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2003	SS-524	Fort Miller Dam to Thompson Island Dam	737117	1585901	A	Linear feature
2003	SS-525	Fort Miller Dam to Thompson Island Dam	737037	1586062	A	Linear feature
2003	SS-526	Fort Miller Dam to Thompson Island Dam	737176	1586171	A	Oblong feature
2003	SS-528	Fort Miller Dam to Thompson Island Dam	737020	1586621	B	Linear feature
2003	SS-529	Fort Miller Dam to Thompson Island Dam	736808	1586968	A	Linear feature
2003	SS-530	Fort Miller Dam to Thompson Island Dam	736798	1587463	A	Linear feature
2003	SS-531	Fort Miller Dam to Thompson Island Dam	737164	1587013	A	Tree?
2003	SS-532	Fort Miller Dam to Thompson Island Dam	737281	1586627	A	Linear feature
2003	SS-533	Fort Miller Dam to Thompson Island Dam	737326	1586533	A	Linear feature
2003	SS-534	Fort Miller Dam to Thompson Island Dam	737307	1586374	A	Linear feature
2003	SS-536	Fort Miller Dam to Thompson Island Dam	737429	1585831	B	Tree?
2003	SS-537	Fort Miller Dam to Thompson Island Dam	737091	1584927	B	Tree?
2003	SS-538	Fort Miller Dam to Thompson Island Dam	737053	1584792	B	Tree
2003	SS-539	Fort Miller Dam to Thompson Island Dam	737012	1584668	A	Linear feature
2003	SS-540	Fort Miller Dam to Thompson Island Dam	736998	1584593	A	Linear feature
2003	SS-543	Fort Miller Dam to Thompson Island Dam	736491	1583160	C	Irregular feature possibly boat/wreck?, 12x6
2003	SS-545	Fort Miller Dam to Thompson Island Dam	735355	1580924	A	Linear feature
2003	SS-546	Fort Miller Dam to Thompson Island Dam	735314	1580680	A	Linear feature
2003	SS-547	Fort Miller Dam to Thompson Island Dam	735248	1580586	A	Linear feature
2003	SS-548	Fort Miller Dam to Thompson Island Dam	735342	1580499	A	Linear feature
2003	SS-549	Fort Miller Dam to Thompson Island Dam	735372	1580401	A	Oblong feature
2003	SS-550	Fort Miller Dam to Thompson Island Dam	736512	1580328	B	Linear feature
2003	SS-552	Champlain Canal Locks 5 to 6	736336	1578145	B	Tree
2003	SS-553	Fort Miller Dam to Thompson Island Dam	735699	1579769	B	Tree?
2003	SS-554	Fort Miller Dam to Thompson Island Dam	735682	1579815	A	Log?
2003	SS-555	Fort Miller Dam to Thompson Island Dam	735589	1579773	B	Log?
2003	SS-556	Fort Miller Dam to Thompson Island Dam	735378	1579910	B	Linear feature
2003	SS-557	Fort Miller Dam to Thompson Island Dam	735301	1580079	B	Linear feature
2003	SS-560	Fort Miller Dam to Thompson Island Dam	735039	1582523	B	Tree
2003	SS-561	Fort Miller Dam to Thompson Island Dam	735332	1582922	A	Linear feature
2003	SS-562	Fort Miller Dam to Thompson Island Dam	735450	1583070	B	Tree?
2003	SS-563	Fort Miller Dam to Thompson Island Dam	735641	1583358	B	Linear feature
2003	SS-564	Fort Miller Dam to Thompson Island Dam	736383	1584224	A	3 linear features
2003	SS-565	Fort Miller Dam to Thompson Island Dam	736372	1584140	A	Linear feature
2003	SS-566	Fort Miller Dam to Thompson Island Dam	736297	1583980	B	Linear feature
2003	SS-567	Fort Miller Dam to Thompson Island Dam	735647	1582748	C	Linear feature
2003	SS-568	Fort Miller Dam to Thompson Island Dam	735064	1581792	A	Linear feature
2003	SS-602	Fort Miller Dam to Thompson Island Dam	735176	1580686	A	2-3 linear features
2003	SS-571	Fort Miller Dam to Thompson Island Dam	735174	1580304	A	Linear feature
2003	SS-572	Fort Miller Dam to Thompson Island Dam	735494	1580084	A	Linear feature
2003	SS-573	Fort Miller Dam to Thompson Island Dam	735745	1579969	B	Crib?
2003	SS-574	Fort Miller Dam to Thompson Island Dam	735710	1579940	A	Linear feature
2003	SS-575	Fort Miller Dam to Thompson Island Dam	735062	1580346	DA	Debris area, 730x100
2003	SS-576	Fort Miller Dam to Thompson Island Dam	734914	1581298	A	2 linear features
2003	SS-577	Fort Miller Dam to Thompson Island Dam	734903	1581369	A	Linear feature
2003	SS-580	Fort Miller Dam to Thompson Island Dam	736010	1583598	A	2 linear features

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2003	SS-581	Fort Miller Dam to Thompson Island Dam	736084	1583638	B	Tree?
2003	SS-582	Fort Miller Dam to Thompson Island Dam	736210	1584061	A	Rectangular feature next to 3-4 linear features
2003	SS-583	Fort Miller Dam to Thompson Island Dam	736228	1585044	B	Crib?
2003	SS-511	Fort Miller Dam to Thompson Island Dam	736209	1585464	A	Linear feature
2003	SS-585	Fort Miller Dam to Thompson Island Dam	736240	1586247	A	Log?
2003	SS-586	Fort Miller Dam to Thompson Island Dam	735719	1586600	B	2 linear features
2003	SS-587	Fort Miller Dam to Thompson Island Dam	736831	1584324	A	Oblong feature
2003	SS-588	Fort Miller Dam to Thompson Island Dam	737158	1585670	B	Linear feature
2003	SS-589	Fort Miller Dam to Thompson Island Dam	737212	1585798	B	Linear feature
2003	SS-590	Fort Miller Dam to Thompson Island Dam	737233	1586265	A	3-4 linear features
2003	SS-591	Fort Miller Dam to Thompson Island Dam	737158	1586586	A	Round feature
2003	SS-592	Fort Miller Dam to Thompson Island Dam	737081	1586726	A	2-3 oblong features
2003	SS-593	Fort Miller Dam to Thompson Island Dam	735705	1582738	A	Oblong feature
2003	SS-594	Fort Miller Dam to Thompson Island Dam	735930	1582958	A	Linear feature
2003	SS-595	Fort Miller Dam to Thompson Island Dam	736180	1583179	A	Linear feature
2003	SS-596	Fort Miller Dam to Thompson Island Dam	736199	1583230	B	Oblong feature
2003	SS-597	Fort Miller Dam to Thompson Island Dam	736345	1583541	A	2-3 linear features
2003	SS-598	Fort Miller Dam to Thompson Island Dam	736564	1584203	A	Linear feature
2003	SS-599	Fort Miller Dam to Thompson Island Dam	736954	1579256	A	Oblong feature
2003	SS-600	Fort Miller Dam to Thompson Island Dam	736827	1579694	C	Linear feature
2003	SS-601	Fort Miller Dam to Thompson Island Dam	736672	1580102	B	Crib?
2003	SS-570	Fort Miller Dam to Thompson Island Dam	735195	1580699	A	2-3 linear features
2003	SS-603	Fort Miller Dam to Thompson Island Dam	735315	1581362	B	Oblong feature
2003	SS-604	Fort Miller Dam to Thompson Island Dam	735336	1581478	A	Linear feature
2003	SS-617	Fort Miller Dam to Thompson Island Dam	735407	1581587	B	Linear feature
2003	SS-619	Fort Miller Dam to Thompson Island Dam	735588	1581976	A	Linear feature
2003	SS-607	Fort Miller Dam to Thompson Island Dam	735669	1581941	A	Linear feature
2003	SS-608	Fort Miller Dam to Thompson Island Dam	735697	1582093	B	2 linear features
2003	SS-609	Fort Miller Dam to Thompson Island Dam	736364	1583351	A	Linear feature
2003	SS-610	Fort Miller Dam to Thompson Island Dam	736564	1583615	A	Oblong feature
2003	SS-611	Fort Miller Dam to Thompson Island Dam	736642	1583895	A	Linear feature
2003	SS-612	Fort Miller Dam to Thompson Island Dam	736754	1584047	A	Oblong feature
2003	SS-613	Fort Miller Dam to Thompson Island Dam	736757	1584176	A	Tire?
2003	SS-614	Fort Miller Dam to Thompson Island Dam	735259	1581250	B	Linear feature
2003	SS-615	Fort Miller Dam to Thompson Island Dam	735284	1581398	B	Oblong feature
2003	SS-616	Fort Miller Dam to Thompson Island Dam	735233	1581574	A	2 linear features
2003	SS-605	Fort Miller Dam to Thompson Island Dam	735397	1581576	A	Linear feature
2003	SS-618	Fort Miller Dam to Thompson Island Dam	735493	1581786	C	Linear feature
2003	SS-606	Fort Miller Dam to Thompson Island Dam	735583	1581972	A	Linear feature
2003	SS-620	Fort Miller Dam to Thompson Island Dam	735840	1582485	B	Tree
2003	SS-621	Fort Miller Dam to Thompson Island Dam	735874	1582559	A	Linear feature and oblong feature
2003	SS-622	Champlain Canal Locks 5 to 6	735091	1568223	B	Isolated feature
2003	SS-430	Champlain Canal Locks 5 to 6	734786	1568575	C	Relic crib?
2003	SS-334	Lock 6 Land Cut	737648	1577782	A	Log?
2003	SS-335	Lock 6 Land Cut	737665	1577644	B	Log?
2003	SS-336	Lock 6 Land Cut	737662	1577525	B	Log?

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2003	SS-337	Champlain Canal Locks 5 to 6	737894	1577237	C	Possible wreck located near NOAA charted wreck location, 200x80
2003	SS-338	Champlain Canal Locks 5 to 6	738108	1576241	DA	Debris area, 190x80
2003	SS-340	Champlain Canal Locks 5 to 6	738179	1575289	A	Linear feature
2003	SS-341	Champlain Canal Locks 5 to 6	738105	1575086	A	Linear feature
2003	SS-342	Champlain Canal Locks 5 to 6	737956	1574980	B	Linear feature
2003	SS-343	Champlain Canal Locks 5 to 6	737577	1574457	B	Linear feature
2003	SS-344	Champlain Canal Locks 5 to 6	737622	1574293	B	2 linear features
2003	SS-345	Champlain Canal Locks 5 to 6	737481	1574179	DA	Debris area, 100x50
2003	SS-346	Champlain Canal Locks 5 to 6	737361	1574063	B	Crib?
2003	SS-347	Champlain Canal Locks 5 to 6	736502	1572899	B	Tree?
2003	SS-348	Champlain Canal Locks 5 to 6	735958	1571788	A	Linear feature
2003	SS-349	Champlain Canal Locks 5 to 6	735850	1571783	DA	Debris area, 110x60
2003	SS-350	Champlain Canal Locks 5 to 6	735639	1571327	B	Possible wreck located near NOAA charted wreck location, 28.5x8
2003	SS-351	Champlain Canal Locks 5 to 6	735498	1571205	DA	Debris area, 60x30
2003	SS-352	Champlain Canal Locks 5 to 6	735555	1571100	B	Linear feature
2003	SS-353	Champlain Canal Locks 5 to 6	735196	1570695	DA	Debris area, 70x50
2003	SS-354	Champlain Canal Locks 5 to 6	735130	1570422	DA	Debris area, 70x50
2003	SS-355	Champlain Canal Locks 5 to 6	735124	1569425	B	Linear feature
2003	SS-356	Champlain Canal Locks 5 to 6	735026	1569296	A	Linear feature
2003	SS-357	Champlain Canal Locks 5 to 6	735057	1568848	A	Linear feature
2003	SS-358	Champlain Canal Locks 5 to 6	735130	1568506	B	Linear feature
2003	SS-359	Champlain Canal Locks 5 to 6	735110	1568289	A	Linear feature
2003	SS-360	Champlain Canal Locks 5 to 6	735129	1568232	A	Log?
2003	SS-361	Champlain Canal Locks 5 to 6	735193	1568056	A	Linear feature
2003	SS-362	Champlain Canal Locks 5 to 6	735225	1568001	A	Linear feature
2003	SS-363	Champlain Canal Locks 5 to 6	735310	1567761	A	2 linear features
2003	SS-364	Champlain Canal Locks 5 to 6	735243	1567699	B	Linear feature
2003	SS-365	Champlain Canal Locks 5 to 6	735372	1567623	A	Linear feature
2003	SS-366	Champlain Canal Locks 5 to 6	735480	1567395	A	2-3 linear features
2003	SS-367	Champlain Canal Locks 5 to 6	736137	1566069	B	Linear feature
2003	SS-368	Champlain Canal Locks 5 to 6	736270	1565771	B	Linear feature
2003	SS-370	Champlain Canal Locks 5 to 6	736281	1564889	A	Square features
2003	SS-371	Champlain Canal Locks 5 to 6	735864	1564392	B	Crib
2003	SS-372	Champlain Canal Locks 5 to 6	735860	1564343	B	Crib
2003	SS-373	Champlain Canal Locks 5 to 6	735853	1564309	B	Crib
2003	SS-374	Champlain Canal Locks 5 to 6	735870	1564262	A	Crib
2003	SS-375	Champlain Canal Locks 5 to 6	735880	1564220	A	Crib
2003	SS-376	Champlain Canal Locks 5 to 6	735884	1564170	B	Crib
2003	SS-377	Champlain Canal Locks 5 to 6	735898	1564129	A	Crib
2003	SS-378	Champlain Canal Locks 5 to 6	735916	1564081	A	Crib
2003	SS-379	Champlain Canal Locks 5 to 6	735938	1564020	A	Crib
2003	SS-380	Champlain Canal Locks 5 to 6	735955	1563980	A	Crib
2003	SS-381	Champlain Canal Locks 5 to 6	735973	1563938	A	Crib
2003	SS-382	Champlain Canal Locks 5 to 6	736712	1562879	B	Linear features
2003	SS-383	Champlain Canal Locks 5 to 6	737206	1562389	A	Log?
2003	SS-384	Champlain Canal Locks 5 to 6	737270	1562332	B	Linear feature

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2003	SS-385	Champlain Canal Locks 5 to 6	737541	1561982	B	Linear feature
2003	SS-386	Champlain Canal Locks 5 to 6	737751	1561566	B	Linear feature
2003	SS-391	Champlain Canal Locks 5 to 6	737774	1561400	B	Linear feature
2003	SS-388	Champlain Canal Locks 5 to 6	737725	1561347	A	Dock
2003	SS-389	Champlain Canal Locks 5 to 6	738013	1561071	B	Log?
2003	SS-390	Champlain Canal Locks 5 to 6	738215	1560629	A	Oblong feature
2003	SS-387	Champlain Canal Locks 5 to 6	737768	1561395	B	2-3 linear features
2003	SS-392	Champlain Canal Locks 5 to 6	737832	1561420	A	Linear feature
2003	SS-393	Champlain Canal Locks 5 to 6	737863	1561273	A	Linear feature
2003	SS-394	Champlain Canal Locks 5 to 6	737963	1560520	B	2 linear features, logs?
2003	SS-395	Champlain Canal Locks 5 to 6	738037	1560486	B	Linear feature
2003	SS-396	Champlain Canal Locks 5 to 6	737876	1560871	B	Linear feature
2003	SS-397	Champlain Canal Locks 5 to 6	735729	1564569	A	2 large objects
2003	SS-398	Champlain Canal Locks 5 to 6	735887	1565406	A	Linear feature
2003	SS-399	Champlain Canal Locks 5 to 6	735444	1566183	B	Linear feature
2003	SS-400	Champlain Canal Locks 5 to 6	735031	1566553	A	Oblong object
2003	SS-401	Champlain Canal Locks 5 to 6	734779	1567098	DA	Debris area, 290x70
2003	SS-402	Champlain Canal Locks 5 to 6	734556	1567779	DA	Debris area, 530x70
2003	SS-403	Champlain Canal Locks 5 to 6	734451	1568362	DA	Debris area, 350x80
2003	SS-404	Champlain Canal Locks 5 to 6	734449	1568783	DA	Debris area, 200x60
2003	SS-405	Champlain Canal Locks 5 to 6	734576	1569253	DA	Debris area, 110x70
2003	SS-406	Champlain Canal Locks 5 to 6	734551	1569500	DA	Debris area, 190x40
2003	SS-407	Champlain Canal Locks 5 to 6	734598	1569962	DA	Debris area, 220x80
2003	SS-408	Champlain Canal Locks 5 to 6	734609	1570270	A	Linear feature
2003	SS-409	Champlain Canal Locks 5 to 6	734765	1570682	B	Linear feature
2003	SS-410	Champlain Canal Locks 5 to 6	735323	1571632	A	3-4 linear features
2003	SS-411	Champlain Canal Locks 5 to 6	735391	1571752	B	Linear feature
2003	SS-412	Champlain Canal Locks 5 to 6	735529	1571974	DA	Debris area, 250x70
2003	SS-413	Champlain Canal Locks 5 to 6	736286	1573264	C	Fallen Tree
2003	SS-414	Champlain Canal Locks 5 to 6	736838	1574413	DA	Debris area, 140x100
2003	SS-415	Champlain Canal Locks 5 to 6	736865	1574658	DA	Debris area, 230x80
2003	SS-418	Champlain Canal Locks 5 to 6	737228	1575513	C	Linear feature
2003	SS-417	Champlain Canal Locks 5 to 6	737304	1575674	DA	Debris area, 300x80
2003	SS-416	Champlain Canal Locks 5 to 6	737231	1575496	A	Linear feature
2003	SS-419	Champlain Canal Locks 5 to 6	736816	1573889	DA	Debris area, 530x190
2003	SS-420	Champlain Canal Locks 5 to 6	736389	1573173	A	Linear feature
2003	SS-421	Champlain Canal Locks 5 to 6	735500	1571671	DA	Debris area, 200x60
2003	SS-422	Champlain Canal Locks 5 to 6	734718	1569953	B	Linear feature
2003	SS-423	Champlain Canal Locks 5 to 6	734657	1569680	B	Rectangular feature
2003	SS-424	Champlain Canal Locks 5 to 6	734632	1569523	B	Oblong feature
2003	SS-425	Champlain Canal Locks 5 to 6	734764	1568068	C	Oblong feature
2003	SS-426	Champlain Canal Locks 5 to 6	734686	1567671	B	Linear feature
2003	SS-427	Champlain Canal Locks 5 to 6	734984	1567921	B	Relic crib?
2003	SS-428	Champlain Canal Locks 5 to 6	734923	1568172	C	Relic crib?
2003	SS-436	Champlain Canal Locks 5 to 6	737196	1574474	DA	Debris area, 630x80
2003	SS-439	Champlain Canal Locks 5 to 6	737526	1574815	DA	Debris area, 700x80

Appendix E - Side-Scan Sonar Debris Survey Code Descriptions

YEAR	TARGET_ID	REACH	EASTING	NORTHING	CLASS	COMMENTS
2003	SS-339	Champlain Canal Locks 5 to 6	737975	1576182	A	Linear feature
2003	SS-467	Champlain Canal Locks 5 to 6	737659	1577344	DA	Debris area, 40x30
2003	SS-470	Champlain Canal Locks 5 to 6	737977	1576772	DA	Debris area, 60x30
2003	SS-471	Champlain Canal Locks 5 to 6	738024	1576565	DA	Debris area, 190x30
2003	SS-369	Champlain Canal Locks 5 to 6	736373	1565105	DA	Debris area, 270x80
2003	SS-486	Champlain Canal Locks 5 to 6	736243	1565721	DA	Debris area, 70x50
2003	SS-494	Lock 6 Land Cut	737056	1588968	DA	Debris area, 40x30
2003	SS-508	Fort Miller Dam to Thompson Island Dam	736107	1584748	DA	Debris area, 260x110
2003	SS-510	Fort Miller Dam to Thompson Island Dam	736104	1585182	DA	Debris area, 410x60
2003	SS-512	Fort Miller Dam to Thompson Island Dam	736225	1585888	DA	Debris area, 150x30
2003	SS-516	Fort Miller Dam to Thompson Island Dam	736321	1584253	DA	Debris area, 60x30
2003	SS-521	Fort Miller Dam to Thompson Island Dam	736671	1584653	DA	Debris area, 150x50
2003	SS-527	Fort Miller Dam to Thompson Island Dam	737038	1586441	DA	Debris area, 100x50
2003	SS-535	Fort Miller Dam to Thompson Island Dam	737418	1586112	DA	Debris area, 100x30
2003	SS-541	Fort Miller Dam to Thompson Island Dam	736894	1584152	DA	Debris area, 340x70
2003	SS-542	Fort Miller Dam to Thompson Island Dam	736277	1582715	DA	Debris area, 2700x110
2003	SS-544	Fort Miller Dam to Thompson Island Dam	735408	1581335	DA	Debris area, 120x90
2003	SS-551	Fort Miller Dam to Thompson Island Dam	736877	1580021	DA	Debris area, 150x110
2003	SS-558	Fort Miller Dam to Thompson Island Dam	734963	1580489	DA	Debris area, 1760x100
2003	SS-559	Fort Miller Dam to Thompson Island Dam	734858	1582007	DA	Debris area, 420x50
2003	SS-569	Fort Miller Dam to Thompson Island Dam	735171	1580879	DA	Debris area, 190x70
2003	SS-578	Fort Miller Dam to Thompson Island Dam	735567	1582985	DA	Debris area, 110x60
2003	SS-579	Fort Miller Dam to Thompson Island Dam	735863	1583347	DA	Debris area, 300x65

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Appendix F

Habitat Suitability Index Models for Key Species

Appendix F - Habitat Suitability Index Models for Key Species

Parameters	Variables	Comments
Belted Kingfisher		
% of shoreline subject to severe wave action	V_1	Not applicable to the Upper Hudson
Average Water Transparency	V_2	
% Water Obstruction	V_3	
% Water Area $\leq$ 60 cm in Depth	V_4	
% Riffles	V_5	Not applicable to the Upper Hudson
Average Number of Lentic Shoreline Containing one or more Perches	V_6	
Distance to nearest suitable soil bank from 1-km sections of lentic shoreline or stream	V_7	
SIW = Water Suitability Index	$(V_2xV_4xV_5)^(1/3)xV_3$	
SIC = Cover Suitability Index	(V_6)	
SIR = Reproductive Suitability Index	(V_7)	
HSI =	Lowest life requisite suitability index for either water (SIW), cover (SIC), or reproductive cover (SIR).	
Yellow Perch		
% of Littoral area	V_1	Used in Lacustrine HSI model
% Pool and Backwater Areas	V_2	
% Cover in Pool and Backwater Areas	V_3	
Temperature (^oC)	V_4	
Temperature - Embryo (^oC)	V_5	
Dissolved Oxygen	V_6	
Degree Days - (4 to 10 ^oC)	V_7	
pH	V_8	
HSI =	Minimum Value of SI's V_2, V3, V4, V5, V6, V7, or V8	
Largemouth Bass		
% Pool, Backwater Area	V_1	
% area $\leq$ 6m deep	V_2	Used in Lacustrine HSI model
% Bottom Cover - Adult, Juvenile	V_3	
% Bottom Cover - Fry	V_4	
Total dissolved solids	V_5	Used in Lacustrine HSI model
Dissolved O_2 (mg/l)	V_6	
pH Range	V_7	
Average Temperature - Adult, Juvenile (^oC)	V_8	
Average Temperature - Embryo (^oC)	V_9	
Average Temperature - Fry (^oC)	V_{10}	
Maximum Turbidity - JTU	V_{11}	
Maximum Salinity - Adult, Juvenile (ppt)	V_{12}	
Maximum Salinity - Fry (ppt)	V_{13}	
Maximum Salinity - Embryo (ppt)	V_{14}	
Substrate Type - Embryo	V_{15}	
Water Level Fluctuation - Adult, Juvenile	V_{16}	
Water Level Fluctuation - Embryo (m)	V_{17}	
Water Level Fluctuation - Fry (m)	V_{18}	

Appendix F - Habitat Suitability Index Models for Key Species

Parameters	Variables	Comments
Largemouth Bass (cont'd)		
Average current velocity at 0.6 depth during summer - Adult, Juvenile	V_{19}	
Current Velocity - Embryo (cm/sec)	V_{20}	
Average current velocity at 0.6 depth during summer - Fry	V_{21}	
Stream Gradient (m/km)	V_{22}	
C_F = Food	$(V_1*((V_3+V_4)/2))^(1/2)$	
C_C = Cover	$(V_1*((V_3+V_4)/2)*((V_{16}+V_{18}/2))^(1/3)$	
C_{WQ} = Water Quality	$(2*V_6+V_7+2*V_8+V_{10}+V_{11})/7$	
C_R = Reproduction	$(V_1*V_9*V_{15}*V_{17}*V_{20})^(1/5)$	
C_{OT}= Other	(V_{22}) or $(V_{19}+V_{21})/2$	
HSI =	$(C_F*C_C*C_{WQ}*C_R*C_{OT})^(1/5)$	If the C_{WQ} or C_R is less than 0.4, then the HSI is the lowest of those measures or the equation provided.
Smallmouth Bass		
Subsstrate Type	V_1	
% Pools	V_2	
Average Depth of lake or reservoir during summer (m)	V_3	Used in Lacustrine HSI model
Average Depth (m)	V_4	
% Cover	V_5	
pH	V_6	
Average TDS levels during the gorwing season (May to October)	V_7	Used in Lacustrine HSI model
Dissolved Oxygen (ppm)	V_8	
Turbidity (JTU)	V_9	
Temperature - Adult (^oC)	V_{10}	
Temperature - Embryo (^oC)	V_{11}	
Temperature - Fry (^oC)	V_{12}	
Temperature - Juvenile (^oC)	V_{13}	
Water Level Fluctuations (m)	V_{14}	
Gradient (m/km)	V_{15}	
C_F = Food	$(V_1*V_2*V_5)^(1/3)$	
C_C = Cover	$(V_1+V_2+V_4+V_5)/4$	
C_{WQ} = Water Quality	$((V_6+V_8+V_9+(2*(V_{10}*V_{12}*V_{13})^(1/3))))/5$	
C_R = Reproduction	$(V_{11}^(2)*V_{14}*V_1*V_5*V_8*V_9)^(1/7)$	
C_{OT}= Other	(V_{15})	
HSI =	$(C_F*C_C*C_{WQ}*C_R*C_{OT})^(1/5)$	If the C_{WQ} or C_R is less than 0.6, then the HSI is the lowest of those measures or the equation provided.

Appendix F - Habitat Suitability Index Models for Key Species

Parameters	Variables	Comments
Common Shiner		
Temperature - Summer (^{o}C)	V_1	
pH	V_2	
Turbidity (JTU)	V_3	
Predominant Substrate Type	V_4	
% Pools	V_5	
Velocity - Pools (cm/s)	V_6	
Pool Class	V_7	
Temperature - Spawning (^{o}C)	V_8	
Velocity - Riffles (cm/sec)	V_9	
% lake area vegetated	V_{10}	Used in Lacustrine HSI model
C_{F-C} = Food-Cover	$(V_4+V_5+V_6+V_7)/4$	
C_{WQ} = Water Quality	$(V_1*V_2*V_3)^{(1/3)}$	
C_R = Reproduction	$(V_8^{2}*V_4*V_9)^{(1/4)}$	
HSI =	$(C_{F-C}*C_{WQ}*C_R)^{(1/3)}$	If the value for any component is $\leq$ 0.4, the HSI = the minimum component value. Otherwise HSI = equation provided.
Muskrat		
% canopy cover of emergent herbaceous vegetation	V_1	Used in Herbaceous wetland and Estuarine HSI models
% of year with surface water present	V_2	
% Stream gradient	V_3	
% of riverine with surface water present during typical minimum flow	V_4	
% riverine channel domminated by emergent herbaceous vegetation	V_5	
% herbaceous canopy cover within 10 m of water's edge	V_6	
% of emergent herbaceous vegetation consisting of persistent life form species	V_7	Used in Estuarine HSI model
% of emergent herbaceous vegetation consisting of Olney bulrush, common three-square bulrush, or cattail	V_8	Used in Herbaceous wetland and Estuarine HSI models
% of open water supporting submerged or floating aquatic vegetation	V_9	Used in Estuarine HSI model
C_C = Cover	$(V_2*V_3*V_4)^{(1/3)}+V_5/2$	
C_F = Food	$V_6+2(V_5)*/2$	
HSI =	Lowest life requisite value for either cover or food	
Great Blue Heron		
Distance between potential nest sites and foraging area	V_1	
Presence of a water body with suitable prey population and foraging substrate	V_2	
A disturbance free zone up to 100 m around potential foraging area	V_3	
Presence of treeland cover types within 250 m of a wetland	V_4	V_4-V_6 are habitat variables for forested wetlands, not
Presence of 250 m (land) or 150 m (water) disturbance free zone around potential nest sites	V_5	riverine but are required for the HSI
Proximity of potential nest site to an active nest site	V_6	
FI = Foraging index	$(V_1*V_2*V_3)$	
HSI =	$(V_1*V_2*V_3*V_4*V_5*V_6)^{(1/2)}$	

Appendix F - Habitat Suitability Index Models for Key Species

Parameters	Variables	Comments
Mink		
% of year with surface water present	V_1	
% tree canopy cover	V_2	Used in palustrine forested (PFO) and palustrine shrub-scrub (PSS) HSI model
% shrub canopy cover	V_3	Used in PFO and PSS HSI model
% canopy cover of emergent vegetation	V_4	Used in PFO, PSS and palustrine emergent marsh (PEM) HSI model
% canopy cover of trees and shrubs within 100 m of the wetland's edge	V_5	
% shoreline cover within 1 m of water's edge	V_6	
SIW = Water Suitablilty Index	V_1	
SIRL = Cover index for riverine and lacustrine cover types	$(V_5*V_6)^{(1/2)}$	
HSI =	Lowest life requisite value for either water or cover	
Wood Duck		
Number of potentially suitable tree cavities/0.4 ha	V_1	
Number of nest boxes/0.4 ha that are predator proof and maintained	V_2	
% of the water surface covered by potential brood cover	V_4	
Density of Potential nest sites/0.4 ha	$(0.18*V_1)+(0.95*V_2)$	
Brood-rearing Index	V_4	
HSI =	Lowest life requisite value for either nesting or brood-rearing	
Bluegill		
% Pool area during average summer flow	V_1	
% Cover (Logs and other objects) within polls or littoral areas during summer	V_2	
% Cover (Vegetation)	V_3	
% littoral area during summer stratification	V_4	Used in Lacustrine HSI model
Average TDS level during growing season	V_5	Used in Lacustrine HSI model
Maximum monthly average turbidity during average summer flow	V_6	
pH range during growing season	V_7	
Minimum dissolved oxygen range during summer	V_8	
Salinity	V_9	
Temperature (Adult)	V_{10}	
Temperature (Embryo)	V_{11}	
Temperature (Fry)	V_{12}	
Temperature (Juvenile)	V_{13}	
Current Velocity (Adult)	V_{14}	
Current Velocity (Embryo)	V_{15}	
Current Velocity (Fry)	V_{16}	
Current Velocity (Juvenile)	V_{17}	
Stream Gradient	V_{18}	
Reservoir drawdown during spawning (Embryo)	V_{19}	Used in Lacustrine HSI model
Substrate Composition (Embryo)	V_{20}	
C_F = Food	$(V_1*V_2*V_3)^{(1/3)}$	

Appendix F - Habitat Suitability Index Models for Key Species

Parameters	Variables	Comments
Bluegill (cont'd)		
C_C = Cover	$V_2+V_3/2$	
C_{WQ} = Water Quality	$(V_6+V_7+2V_8+V_9+2[(V_{10}*V_{12}*V_{13})^(1/3)])/7$	
C_R = Reproduction	$(V_{11}*V_{15}*V_{20})^(1/3)$	
C_{OT}= Other	$(V_{14}+V_{16}+V_{17}/3)+V_{18}/2$	
HSI =	$(C_F*C_C*(C_{WQ}^(2))*C_R*C_{OT})^(1/6)$	
If C_{WQ} or C_R are $\leq$ 0.4, use lowest component rating as the species HSI		
Snapping Turtle		
Food		
Mean Water temperature at mid-depth during summer ^oC	V_1	
Mean current velocity at mid-depth during summer (cm/s)	V_2	
% Canopy cover of aquatic vegetation in the littoral zone	V_3	
Winter Cover		
Maximum water depth greater than maximum ice depth	V_4	
% silt in substrate	V_5	
Reproduction		
Distance to small stream (km)	V_6	
Interspersion		
Distance to permanent water (km)	V_7	
SIF = Food Suitability Index	$(V_1*V_2*V_3)^(1/3)$	
SIWC = Winter Cover Suitability Index	V_4*V_5	
SIR = Reproduction Suitability Index	V_6	
SII = Interspersion Suitability Index	V_7	
HSI =	(SIF*SIWC*SIR)^(1/3)*SII	

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