QUALITY ASSURANCE PROJECT PLAN (QAPP) FOR THE PECONIC ESTUARY CONCEPTUAL HABITAT RESTORATION DESIGN PLANNING SERVICES PROJECT (SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES)

PREPARED BY

LAND USE ECOLOGICAL SERVICES, INC.

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Quality Assurance Project Plan (QAPP) for the Peconic Estuary Conceptual Habitat Restoration Design Planning Services Project

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The attached Quality Assurance Project Plan for the Peconic Estuary Conceptual Habitat Restoration Design Planning Services Project is hereby recommended for approval.

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1. PROJECT MANAGEMENT

This section of the Quality Assurance Project Plan addresses the project management components associated with the project.

1.1 INTRODUCTION TO QUALITY ASSURANCE PROJECT PLAN

The purpose of this Quality Assurance Project Plan (QAPP) is to ensure that the environmental data collection and recording procedures are sufficient to ensure that the resulting products and deliverables will meet project objectives. The document will provide a review of the environmental data collection procedures and review of the collected environmental data to assure the procedures outlined are followed. Upon providing a signature on pages 2-3 of this document, project participants and Quality Assurance managers agree that if the QA procedures outlined herein are adhered to, project delivables will be of suitable quality.

1.2 DISTRIBUTION LIST AND TECHNICAL ADVISORY COMMITTEE

The individuals listed below (Table 1) will receive original copies of the approved Quality Assurance Project Plan (QAPP).

Table 1 includes all individuals directly responsible for project implementation or US EPA review and approval of the QAPP.

Table 1. Parties Responsible for Project Implementation

Name	Title	Organization	Contact Information
Sheri Jewhurst	Project Officer	EPA Region 2	290 Broadway New York, NY 10007-1866 jewhurst.sheri@epa.gov
Carol Lynes	QA Manager/ Team Leader Air and Water Quality Assurance Team	EPA Region 2	U.S. EPA Region 2 DESA/MAB (MS 220) 2890 Woodbridge Avenue Edison, NJ 08837-3679 lynes.carol@epa.gov
Joyce Novack	Program Director, Peconic Estuary Program	Suffolk County Department of Health Services	360 Yaphank Ave, Suite 2B Yaphank, NY 11908 631-852-2961 joyce.novack@suffolkcountyny.gov
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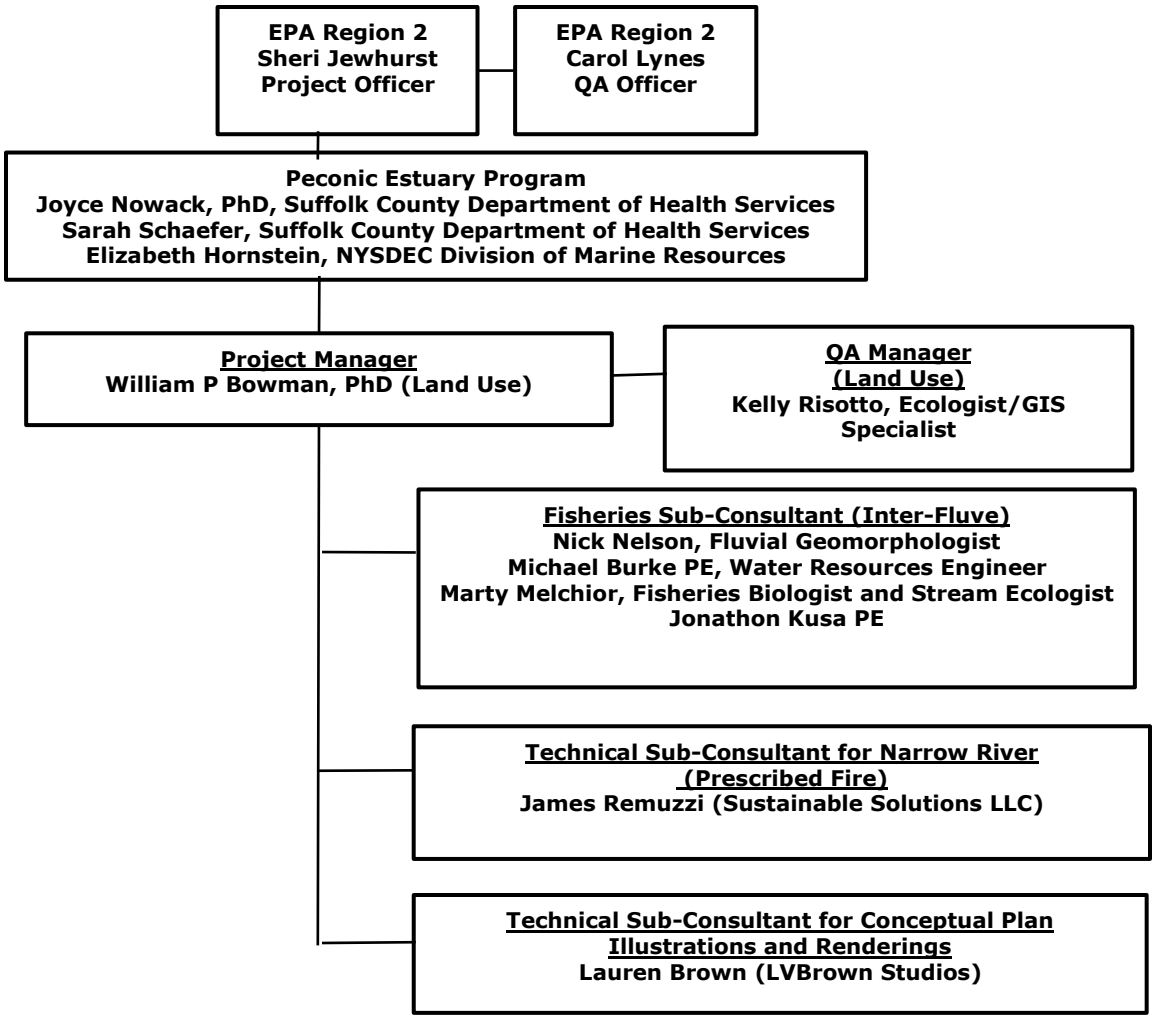
William Bowman	Project Manager, Senior Scientist	Land Use Ecological Services	570 Expressway Drive South, Suite 2F Medford, NY 11763 631-727-2400 wbowman@landuse.us
Kelly Risotto	QA Manager, Senior Scientist	Land Use Ecological Services	570 Expressway Drive South, Suite 2F Medford, NY 11763 631-727-2400 krisotto@landuse.us
Nick Nelson	Geomorphologist	Inter-Fluve	220 Concord Avenue, 2nd Floor | Cambridge, MA 02138 617-714-5537 nnelson@interfluve.com

1.3 PROJECT ORGANIZATION

This section provides an overview of the organizations involved in this project and the roles and responsibilities of the individuals within each organization. The primary organizations involved include the U.S. EPA, Suffolk County and NYSDEC, Land Use Ecological Services, Inc. and Inter-Fluve, Inc. Below (Figure 1) is an illustration of the overall organizational relationship between key personnel within these agencies. The specific responsibilities and key personnel assigned to this project are described in detail below.

Figure 1. Project Organizational Chart



The **Peconic Estuary Program (PEP)** is the lead agency in this project. Key personnel include:

Joyce Nowack, Sarah Schaefer, and Elizabeth Hornstein – Dr. Nowack, Ms. Schaefer, and Ms. Hornstein will oversee the progress of the project and will monitor project activities to ensure their adherence to the approved QAPP and contract terms.

The **United States Environmental Protection Agency (EPA Region 2)** will review the project's QAPP. No field data collection shall begin until ERA Region 2 approval of the QAPP is received. Key personnel include:

Sheri Jewhurst, Project Officer – As Project Officer, Ms. Jewhurst will review and approve the QAPP and final project deliverables to ensure their consistency with the environmental outputs and outcomes expected to result from this project.

Carol Lynes, Quality Assurance Officer – Will review and approve the QAPP on behalf of the EPA Region 2 QA Unit.

Land Use Ecological Services is the lead contractor that will be performing the project work.

Land Use Ecological Services will act as the lead consultant in all aspects of the project, including QAPP development; environmental data collection and site research and analysis; coordination and preparation of *Interim Presentations on Existing Conditions and Schematic Designs* for all four sub-projects; coordination and preparation of recommendations and conceptual habitat restoration plans for all four sub-projects; coordination and scheduling of kick-off meetings, interim progress meeting, and wrap-up meeting; and production and submission of final deliverable reports. Key personnel include:

William Bowman, Project Manager – Dr. Bowman will be responsible for ensuring that the all tasks are completed in a timely, professional and cost-effective manner; he will also be the primary point of contact between the project team and Suffolk County. In particular, the Project Manager, who is an expert in Long Island's terrestrial and wetland ecosystems, will directly oversee the field research and environmental data collection, preparation of schematic designs and incorporation of feedback and comments from project partners, and development of final recommendations and conceptual designs for the four restoration designs.

Kelly Risotto, Quality Manager – As the QA/QC Manager for this project, Ms. Risotto be responsible for developing the QAPP, for ensuring that the QAPP is fully implemented during all phases of the project related to collection and analysis of environmental data, for reporting any deficiencies to project management at Suffolk County, and for generally overseeing all QA/QC related activities.

Land Use shall utilize approved sub-contractors to provide specific technical expertise related to several aspects of the project.

Inter-Fluve, Inc., a sub-consultant to the project, will be involved in the field research and environmental data collection, schematic design preparation, and final recommendations and conceptual designs for fish passage improvements, tidal hydrology restoration, and stormwater management. Key personnel include:

Nick Nelson, Geomorphologist – Mr. Nelson is the project team's expert in hydrology and aquatic habitat and fish passage restoration. He and his team conduct will conduct field research and environmental data collection at the Narrow River, Lake Montauk, and Main Road MH-2 restoration sites and be responsible for contributing to the production of schematic designs and the final conceptual plans for these three sites and assist the Project Manager with the preparation of the final report and recommendations.

Marty Melchior, Michael Burke, and Jonathon Kusa, Project Support – Mr. Melchior, Mr. Burke, and Mr. Kusa will assist Mr. Nelson with the preparation of schematic and conceptual designs for the fish passage restoration (Melchior), tidal hydrology restoration (Burke), and stormwater management (Kusa) projects.

James Remuzzi (Sustainable Solutions LLC) is prescribed fire Burn Boss who will serve as a technical consultant in assessing the feasibility and implementation logistics of utilizing prescribed fire (solely or in conjunction with tidal hydrology restoration) to manage invasive *Phragmites* at the Narrow River project site.

Lauren Brown, ASLA, LEED AP (LVBrown Studios) is an illustrator and graphic designer. Ms. Brown shall serve as a sub-contractor that will contribute to the development of high-quality, visually-appealing conceptual plans and renderings of the recommended restoration actions.

1.4 PROBLEM DEFINITION/BACKGROUND

The Peconic Estuary (PE) is one of 28 designated "Estuaries of National Significance" under Section 320 of the Federal Clean Water Act. One of the goals in the Peconic Estuary Program (PEP)'s approved Comprehensive Conservation and Management Plan is to restore and enhance degraded habitats within the PE watershed and improve the quantitative and qualitative functions and services they provide. In 1997, the PEP Habitat Restoration Workgroup (HRWG) was formed and charged with identifying important Peconic natural habitats with enhancement or restoration potential, developing overall habitat restoration goals, and identifying and prioritizing potential restoration projects. In 2000, the HRWG finalized the Habitat Restoration Plan for the PE which indentifies 72 sites in need of restoration. In 2009, the PEP Natural Resources Subcommittee (NRS) initiated efforts to assess the status and remaining restoration needs at sites included in the 2000 PEP Habitat Restoration Plan, to identify new candidate sites for restoration, and to develop a 2009 PEP Habitat Restoration Plan. In 2014, the 2014 Implementation Progress Report: Habitat Restoration Plan reported that of the seventy-one (71) projects listed in the 2009 Habitat Restoration Plan, plus an additional three (3) projects that have commenced or have been completed since 2009, for a total of seventy-four (74) projects. In support of implementing the 2009 PEP Habitat Restoration Plan and completing the thirty-two (32) projects listed as not yet initiated in the 2014 Implementation Progress Report: Habitat Restoration Plan, the PEP NRS has identified four (4) sites which require additional site investigations and conceptual designs before implementation funding is sought. The four (4) selected and approved projects are: Narrow River Road Hydrological Improvements and *Phragmites* Management, Iron Point Wetland Restoration, Lake Montauk Alewife Access and Habitat Enhancement, and MH-2 Main Road Wetland Construction.

This project shall focus on developing separate Conceptual Habitat Restoration Design Plans for these four sites. Field research shall include collection of information on existing biological, hydrological, and physical conditions, described in detail in *Section 1.5.2*, at each of the four sites. Findings to be presented to Peconic Estuary Program shall include: narrative descriptions of existing site conditions, existing and created maps and diagrams for analysis, and photos of the existing site and conditions. The project team shall establish a framework

of recommendations and the development of schematic designs for actions at each site. The final recommendations and conceptual restoration plan for each site will provide narrative text and illustrative drawings depicting what the restoration site might look like subsequent to project construction. Each site narrative must include information necessary to implement the final conceptual plan including: actions to be taken, estimates of materials needed, implementation objectives, phasing plans, possible required permits, and preliminary cost estimates.

1.5 PROJECT TASKS

1.5.1 Task One - Prepare a Quality Assurance Project Plan

The collection and use of environmental data for the four selected ecological restoration projects shall be consistent with a USEPA-approved *Quality Assurance Project Plan (*QAPP) developed by Land Use Ecological Services. Sample collection and analysis are not required for the development of conceptual restoration plans for three of the project sites. Limited sediment sampling and laboratory analysis will be completed for the Iron Point wetland restoration project.

Environmental data shall consist of the collection and use of GIS data to document existing environmental conditions and the collection of basic dimensional measurements for the each of the four restoration plans. Collected GIS data will include locations of potential fish passage barriers; culverts, outfalls, or stormwater drainage infrastructure; boundaries of ecological communities or other important ecological features such as tidal or freshwater wetland features, boundaries of invasive plant stands/infestations, marsh ditches or channels, or top/bottom of slopes, berms, or banks; hazardous fuel accumulations; locations of utilities or other infrastructure; and potential site access/egress paths. Environmental and site data that may be collected for these projects would include simple in-field measurements of the dimensions of the previously described features such as stream width above and below a potential fish barrier or culvert, stream water depth above and below the potential fish barrier or culvert, culvert dimensions, stream/channel width or depth, relative vertical distance (e.g. vertical distance between the upstream and downstream ends of a culvert) to prepare conceptual cross-sections of recommended restoration actions, and water velocity.

All GIS data produced will adhere to the requirements of EPA's National Geospatial Data Policy (NGDP) (United States EPA, 2008). In addition, secondary GIS data shall be obtained from the New York State GIS Clearinghouse and/or local municipalities. The QA Manager for the project shall be Ms. Kelly Risotto, as indicated on the provided Project Organization Chart.

1.5.2 Tasks Two through Four – Research & Site Analysis, Vision & Schematic Designs, Recommendations & Conceptual Habitat Restoration Plans for Narrow River Road, Iron Point, Lake Montauk, and Main Road MH-2 Sites

The following section describes the technical approach that will be employed for the field investigations and analysis of the existing field conditions at each project site and an outline of

the deliverables, including restoration recommendations and conceptual designs, for each project site. General location maps for each of the sites are provided in Appendix A.

i. Narrow River Road

Hydrological barriers and invasive *Phragmites australis* infestations at Broad Meadows and Whitcom marshes in the headwaters of Narrow River shall be evaluated by William Bowman, PhD of Land Use, Nick Nelson of Inter-Fluve, and James Remuzzi of Sustainable Solutions through on-site field inspection and collection of pertinent environmental data. Emphasis will be on the identified culverts that restrict tidal flow into these marshes, specifically the double culvert with malfunctioning tide gate at the downstream limit of Broad Meadows Marsh and the culvert under Route 25 between Broad Meadow Marsh and Whitcom Marsh. Field investigations shall be completed in summer of 2018.

Data to be collected during field inspection of Narrow River shall include:

- GPS locations of all pertinent structures and ecological features. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Dimensional measurements, observations, and hydraulic data required to adequately characterize each structure including dimensions and materials of culverts, invert and earthen dam elevations, and vertical drop. Measurement accuracy and procedures are presented in *Section 1.9.2(ii) and 2.2.2*;
- Spring High Water and Tidal Wetland Boundary elevations downstream of culverts based on nearby tidal wetlands communities;
- GPS locations of invasive plant stands, native ecological community boundaries (following ecological community descriptions in Edinger et al (2014)), potential locations for fire lines and drafting points to implemented for prescribed fire; mapping of onsite fuels conditions, including identification of hazardous fuel accumulations adjacent to *Phragmites* that would need to be pre-treated prior to introducing prescribed fire; and potential site access/egress routes;
- GPS locations of suitable habitat for any rare and protected wildlife and flora listed by the New York State Natural Heritage Program as known to occur in the immediate vicinity of Broad Meadow or Whitcom Marshes.
- Site photographs

The project team shall also obtain, review, and utilize available GIS data from the Town of Southold, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions and to prepare a topographic map of the Broad Meadows-Whitcom Marsh complex including:

- High resolution orthoimagery,
- 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography, and
- Suffolk County real property records to access property ownership.

The project shall develop a schematic design for improving tidal flow and implementation of prescribed fire at Broad Meadows and Whitcom Marshes. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail (e.g. 0.5 ft resolution orthoimagery available from NYS GIS Clearinghouse) to

promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use and Nick Nelson of Inter-Fluve.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for the improvement of tidal flow, implementation of prescribed fire, and prioritization of ecological restoration actions.

The final recommendations report shall include:

- Site Map of Narrow River and Broad Meadow-Whitcom Marshes and surrounding area based on GPS data collected by Project Team and GIS data available from NOAA, New York State, Suffolk County, and Town of Southold;
- Site topography based on LIDAR data;
- Mapped extent of Phragmites marsh and identification of adjacent ecological communities based on field delineation and existing aerial imagery;
- Map of adjacent existing land uses and property ownership based on Suffolk County GIS data;
- Site Photographs;
- Habitat recommendations, corrective actions, and objectives;
- Recommendations for stakeholder outreach needed to implement prescribed fire;
- Potential site access routes and work staging areas;
- Existing infrastructure that may be impacted;
- Preliminary cost estimates for primary culvert modifications and prescribed fire implementation
- Environmental permitting requirements
- Assessment of potential impacts of tidal flow improvements to nearby infrastructure and agricultural lands due to coastal flooding

The final concept drawings prepared by the project team shall present:

- Overview aerial of entire project area noting the location of individual sites of recommend restoration actions.
- Visual illustration of the strategy for culvert modification, repair, or removal to provide tidal flow restoration
- Close-up of each potential work site showing existing and proposed conditions including infrastructure, access routes, potential remediation work areas, work limits, sensitive ecological resources, and property boundaries
- Plan view locations of safety zones, firelines, and no fire areas for fire restoration projects
- Plan-view locations of existing and proposed ecological habitat types

ii. Iron Point Wetland Restoration

Existing ecological conditions in Iron Point marsh including distribution of native marsh communities, *Phragmites* infestations, and pannes/ponds; existing ditch locations and dimensions, and barriers to tidal exchange shall be evaluated by William Bowman, PhD of Land Use. Field investigations shall be completed in summer of 2018.

Data to be collected during field investigations of Iron Point shall include:

- GIS Mapping of marsh community boundaries (following Edinger et al. 2014) and other pertinent ecological features. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Quantification of existing total marsh area, existing intertidal and high marsh areas, existing marsh pond/panne areas, and existing *Phragmites* marsh area;
- Existing berm, berm gap, and marsh ditch dimensions and existing elevation and relative vertical distance of existing marsh communities. Measurement accuracy and procedures are presented in *Section 1.9.2(ii) and 2.2.2*;
- Potential Access Routes and Plant Community Composition in Potential Access Routes;
- GPS locations of suitable habitat for any rare and protected wildlife and flora listed by the New York State Natural Heritage Program as known to occur in the immediate vicinity of Iron Point marsh or observations of rare and protected wildlife and flora.
- Collection of two (2) marsh sediment samples and analysis for contaminant concentrations. Sediment sampling and analytical procedures are presented in *Sections 1.9.2(iii) and 2.2.3*;
- Site Photographs.

The project team shall also obtain, review, and utilize available GIS data from the Town of Southampton, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions and to prepare a topographic map of the Iron Point marsh complex including:

- High resolution orthoimagery,
- 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography, and
- Suffolk County real property records to access property ownership.

The project shall develop a schematic design for improving tidal flow and controlling invasive *Phragmites* by construction of new marsh channels or expansion of existing marsh ditches. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail (e.g. 0.5 ft resolution orthoimagery available from NYS GIS Clearinghouse) to promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for marsh channel construction, reasoning for recommendations, expected obstacles and advantages, and summary of sediment analytical results and implications for disposal or re-use of excavated sediments.

The final recommendations report shall include:

- Site Map of Iron Point Marsh and surrounding uplands based on GPS data collected by Project Team and GIS data available from NOAA, New York State, Suffolk County, and

Town of Southampton;
- Site topographic map based on LIDAR data;
- Ecological communities map based on field delineation of community boundaries. GPS locations of suitable habitat or documented observations of any rare and protected wildlife, flora, or ecological communities listed by the New York Natural Heritage Program;
- Habitat recommendations, corrective actions, and objectives;
- Locations for recommended new berm gaps and marsh channels;
- Potential site access routes and work staging areas with adequate physical separation from pilot permeable reactive barrier project (location identified in Appendix B);
- Results of sediment borings and laboratory analyses;
- Preliminary cost estimates for design and construction;
- Environmental permitting requirements and additional sediment testing requirements for regulatory approval;
- Site Photographs;

The final concept drawings prepared by the project team shall present:
- Sheet 1 – Overview aerial of entire project area noting existing proposed conditions
- Sheets 2-3– Plan and section views of proposed condition including recommended berm gaps and marsh channels, access routes, work limits, sensitive ecological resources and infrastructure, and property boundaries
- Sheet 4- Typical details of proposed work.

iii. Lake Montauk Alewife Access and Habitat Enhancement

Fish passage conditions between Lake Montauk and Stepping Stones Pond and Big Reed/Little Reed Ponds shall be evaluated by Nick Nelson and Michael Burke of Inter-Fluve through on-site field inspection and collection of pertinent environmental data. Potential barriers to fish passage include culverts, shallow stream reaches, and dense stands of emergent vegetation. Our team shall determine if each of these potential barriers between Lake Montauk and either Stepping Stones Pond or Big Reed Pond serves as an actual barrier to migratory fish. William Bowman, PhD of Land Use shall be responsible for wetland delineations, ecological community mapping, and assessment of potential impacts to NYS-protected wildlife or plans for conceptual plan development and future environmental permitting. Field investigations shall occur in summer of 2018.

Data to be collected during field inspections at Stepping Stones Pond and Big Reed/Little Reed Pond shall include:
- GPS locations of all potential fish barriers. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Dimension and materials of each culvert or barrier including pertinent elevations. Topographic and hydraulic data required to adequately characterize each barrier. Measurement accuracy and procedures are presented in *Sections 1.9.2(ii) and 2.2.2*;
- General observations with respect to high water marks, sediment composition, channel conditions and stability, frequency of tidal influence, etc.;
- GPS locations of tidal wetland boundary for planning and review by regulatory agencies;

- GPS locations of ecological community boundaries adjacent to observed fish barriers and locations of any significant ecological communities or habitats for significant plant or wildlife species located within potential access routes or work areas;
- Site photographs.

The project team shall also obtain, review, and utilize available GIS data from the Town of East Hampton, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions:

- High resolution orthoimagery,
- 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography, and
- Suffolk County real property records to access property ownership.

The project shall develop schematic design for removal of barriers to each observed fish passage at Stepping Stones Pond and Big Reed/Little Reed Ponds. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail to promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use and Nick Nelson of Inter-Fluve.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for the correction of each identified fish obstruction, reasoning for recommendations, expected obstacles and advantages, and the prioritization of fish barrier removal.

Final recommendations report prepared by Land Use and Inter-Fluve shall include:

- Site Map of Stepping Stones Pond and Big Reed/Little Reed Pond based on GPS data collected by project team and Site and GIS data available from NOAA, New York State, Suffolk County, and Town of East Hampton;
- Site topographic map based on LIDAR data;
- Characterization of ecological communities adjacent to potential fish barriers and target waterways based on Ecological Communities of New York State (Edinger et al, 2014). GPS locations of suitable habitat for any rare and protected wildlife, flora, or ecological communities listed by the New York Natural Heritage Program;
- Locations of fish barriers including culverts, shallow waterbody reaches, accumulated debris, and stands of emergent vegetation;
- Map of adjacent existing land uses and property ownership based on Suffolk County GIS data, etc.
- Site Photographs within each reach of the target waterbodies and photographs of each potential obstruction to fish passage;
- Potential site access routes and work staging areas;
- Existing infrastructure that may be impacted;
- Preliminary cost estimates for the design and construction of each fish passage project
- Environmental permitting requirements.

The final concept drawings prepared shall present:

- Overview aerial of entire project area noting the location of individual sites
- Close-up of each site showing existing and proposed conditions including infrastructure, access routes, potential remediation work areas, work limits, sensitive ecological resources, and property boundaries

iv. Main Road MH-2 Wetland Construction

Existing stormwater infrastructure and ecological conditions at the Main Road MH-2 wetland shall be evaluated by William Bowman, PhD of Land Use and Nick Nelson on Inter-Fluve. Field investigations shall be completed in summer of 2018.

Data to be collected during field investigations shall include:

- GPS locations of existing stormwater drainage infrastructure. GPS locations of freshwater wetland boundary for concept plan development and review by regulatory agencies. GPS locations of upland and wetland community boundaries in and adjacent to project area and characterization of plant species composition, including mapping stands of upland and wetland invasive plants to identify potential mitigation areas if sediment forebay cannot be located entirely within upland area adjacent to Route 24. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Location, elevation, dimensions, materials, and condition of existing stormwater outfall. Topographic data required to prepare conceptual plan for recommended sediment forebay and overflow spillway to existing freshwater wetland. Measurement accuracy and procedures are presented in *Sections 1.9.2(ii) and 2.2.2*;
- Locations of existing utility infrastructure;
- GPS locations of suitable habitat for any rare and protected wildlife and flora listed by the New York State Natural Heritage Program as known to occur in the immediate vicinity of Iron Point marsh or observations of rare and protected wildlife and flora.
- Site photographs.

Our team shall also review and analyze available data including GIS data from the Peconic Estuary Program, Town of Riverhead, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions at the MH-2 site including:

- High resolution orthoimagery;
- LIDAR or digital elevation model data to assess general site topography, and;
- Suffolk County real property records to access property ownership.

The project shall develop a schematic design identifying the potential location(s) of the recommended sediment forebay and stormwater wetland, existing infrastructure, freshwater wetland boundary, and ecological community boundaries. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail (e.g. 0.5 ft resolution orthoimagery available from NYS GIS Clearinghouse) to promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use and Nick Nelson of InterFluve.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for the stormwater wetland and sediment forebay construction, reasoning for recommendations, and expected obstacles and advantages.

The final recommendations report shall include:

- Site Map of the Main Road MH-2 wetland and surrounding uplands based on GPS data collected by Project Team and GIS data available from NOAA, New York State, Suffolk County, and Town of Riverhead;
- Site topographic map based on LIDAR data;
- Ecological communities map based on field delineation of community boundaries. GPS locations of suitable habitat or documented observations of any rare and protected wildlife, flora, or ecological communities listed by the New York Natural Heritage Program;
- Location of existing stormwater drainage structures, utility(s), and road infrastructure;
- Pertinent elevation data from field data collection;
- Potential location(s) and sizing for the recommended sediment forebay and stormwater wetland;
- Potential locations of mitigation areas to compensate for unavoidable wetland impacts due to construction.
- Preliminary cost estimates for design and construction;
- Construction access routes and staging areas;
- Environmental permitting requirements;
- Site Photographs.

The final concept drawings prepared by the project team shall:

- Meet the design standards contained in the 2015 New York State Stormwater Management Design Manual (NYSDEC, January 2015).
- Provide an overview aerial of entire project area;
- Identify existing and proposed conditions including infrastructure, forebay maintenance routes, freshwater wetland boundary, potential mitigation areas to compensate for wetland disturbance, limits of clearing and ground disturbance, and property boundaries;
- Identify permanent access area/route to allow for annual removal of accumulated sediments within forebay;
- Identify typical details and specifications of the proposed recommendations.

1.5.3 Task Five - Meetings

Land Use shall coordinate and schedule three meetings with the County and pertinent stakeholders:

- Kick-off meeting (April 19, 2018): To share the project team's technical approach with the County and pertinent stakeholders and obtain project-specific information.
- Interim Progress Meeting (on or about November 15, 2018): To present results of research and analysis of existing conditions and present schematic designs to the County and pertinent stakeholders.
- Wrap-Up Meeting (on or about March 1, 2019): To present the final report on

recommendations and conceptual design plans.

- Land Use shall schedule and attend any informal meetings with local stakeholders necessary to attain feedback for the development of conceptual designs and to maintain progress on accomplishing required tasks. These informal meetings will be scheduled *ad hoc* and only if it is determined by the contractor that a meeting is necessary to the effective progress and completion of the required tasks. For example, it may be necessary to meet with a stakeholder group, such as one of the Town agencies, to obtain and discuss previously collected data or information. It is not possible or necessary to determine a minimum number of informal meetings for the project and to predict when it might be necessary to schedule these informal meetings.

1.5.4 Task Six – Report Submission

A written draft Final Report shall be delivered to the County and Peconic Estuary Program (PEP) at least two weeks prior to the Final Wrap-Up meeting where the Final Presentation of our findings, recommendations, and conceptual plans will be delivered to the County and stakeholders. The Final Report shall contain all relevant written materials, field data, maps, schematic plans, and conceptual plans developed during the completion of Tasks 2-4 and shall contain an executive summary. The draft Final Report will be amended based on comments received from the County and pertinent stakeholders. Written comments may be submitted to Land Use, or verbal comments may be given after the Final Presentation. After amendment of the draft report, the final Final Report shall be submitted to the County, PEP Office, and US EPA Region 2. Ten (10) hard color copies shall be provided and five (5) CDs containing a PDF of the Final Report and all associated data, files, maps, plans, etc. All graphics shall be suitable for posting to Suffolk County or PEP's websites.

1.6 PROJECT SCHEDULE

The timeline for completion of the contract tasks for the Peconic Estuary Conceptual Habitat Restoration Design Planning Services project is presented in Table 2.

Table 2: Project Timeline

Task	*Expected Commencement and Completion Dates for Project Tasks*	*Expected # of Weeks Required for Task Completion*
QAPP Approval Procurement (Task 1)	April-July 2018	16 Weeks
Kick-off Meeting (Task 5)	April 19, 2018	2 Weeks
Research and Site Analysis (Task 2)	July-September 2018	6 Weeks
Visioning and Schematic Design (Task 3)	October-November 2018	6 Weeks
Interim Progress Meeting (Task 5)	November 15, 2018	2 Weeks

Recommendations and Conceptual Restoration Plans (Task 4)	November 2018- February 2019	6 Weeks
Presentation of *Draft Final Report* at Final Wrap-up Meeting (Task 5)	March 1, 2019	2 Weeks
Submission of *Final Report* (Task 6)	April 1, 2019	4 Weeks
Total	April 1, 2019	

1.7 BUDGET CONSTRAINTS

The total budget for the project is $99,980.00 provided through a contract with Suffolk County Department of Health Services. The budget is based on a reasonable number of person hours required to meet all of the project objectives, with technical and scientific experts.

1.8 GEOGRAPHIC LOCATION AND STUDY AREAS

The study area for this project includes the following locations (Appendix A):

a. Narrow River (Orient, NY) between tidal reaches of Narrow River and Whitcom Marsh including Broad Meadows March. This length of this reach of Narrow River is approximately 0.5 miles.

b. Iron Point (Flanders, NY) including the approximately 17.5 acre tidal marsh tributary to the mouth of the Peconic River between Woodroad Trail and Point Road. The study area for the Iron Point project consists of the area contained within a polygon defined by the latitude/longitude positions provided in Table 4 of *Section 2.1.1 (Environmental and Site Conditions)* .

c. Lake Montauk (Montauk, NY) including the culvert and ditch conveying water from Stepping Stones Pond to Lake Montauk and the waterway between Lake Montauk, extending through Little Reed Pond, to the open waters of Big Reed Pond culvert. The length of these waterways is approximately 200 feet and 0.9 miles for Stepping Stones Pond and Big Reed Pond/Little Reed Pond, respectively.

d. Main Road MH-2 (Aquebogue, NY) including the 2.61 acre Town of Riverhead-owned property at 705 Main Road in Aquebogue (SCTM#: 600-67-2-27) and the reach of Main Road (and its right-of-way) located immediately north of the subject property.

1.9 QUALITY OBJECTIVES & CRITERIA FOR PRIMARY & SECONDARY DATA

1.9.1 Objectives and Project Decisions

The main objective of this project is to analyze existing conditions, assess the feasibility of obtaining ecological restoration objectives, and prepare conceptual designs for four habitat restoration projects within the Peconic Estuary before implementation funding is sought.

The field research and environmental data collection that shall be used to develop the conceptual restoration plans are described in detail for each of the four sites in *Section 1.5.2 (Tasks Two through Four).* The findings of the field research and environmental data collection that shall be presented to PEP will include: narrative descriptions of existing site conditions, existing and

created maps and diagrams for analysis by the PEP and project stakeholders, and photos of the existing site and conditions. The contractor team shall establish a framework of recommendations and develop schematic designs for the potential changes (i.e. restoration actions) to each site. The final recommendations and conceptual restoration plan for each site will provide narrative text and illustrative drawings depicting what the implemented restoration action might look like. Each site narrative shall include necessary implementation information such as: restoration actions to be taken, estimates of materials needed, implementation objectives, phasing plans, required permits, and preliminary cost estimates.

The project does not involve the production of bid documents and construction drawings and specifications. Accordingly, accuracy standards for the conceptual design plans are not expected to be as rigorous as those needed for final bid documents and engineered site plans and specifications. At this conceptual design phase, it is most important to ensure that the most ecologically appropriate, technically feasible, and cost-effective restoration strategy is selected.

The conceptual designs must be of sufficient accuracy to allow for the final engineering designs and cost estimation phases of implementation funding to commence. The adequacy of the conceptual designs for these purposes is directly dependent on the quality and accuracy of the environmental data collected.

The anticipated accuracy of each aspect of environmental data collection is described in *Sections 1.9.2 (Data Acceptance Criteria), 2.1 (Sampling Design),* and *2.2 (Sampling Methodolgy).* For example, the anticipated accuracy of the GPS data collection is expected to be ±0.5m. This GPS accuracy and the anticipated accuracy of other environmental data collection are adequate for the development of conceptual design plans, as described below. *Sections 2.2 (Sampling Methodology), 2.5 (Quality Control)* and *4.2 (Verification and Validation Methods)* describe the quality assurance goals and procedures that will be implemented to ensure that anticipated accuracy standards are met. Implementation of these procedures shall ensure that the conceptual designs based on the collected environmental data will be sufficient to allow for engineering design and cost estimate phases to commence.

1.9.2 Primary Data Acceptance Criteria

Field data will be collected and examined in terms of the following numerical data quality indicators and guidelines to ensure that all data generated during field surveys are of appropriate quality to fulfill the project goals described above. These data quality indicators include the following:

- **Precision** is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions; calculated as either the range or as the standard deviation. It may also be expressed as a percentage of the mean of the measurements, such as relative range or relative standard deviation (coefficient of variation).
- **Bias** is the systematic or persistent distortion of a measurement process that causes errors in one direction.
- **Accuracy** is measure of the overall agreement of a measurement to a known value; it includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations.
- **Representativeness** is the degree to which data accurately and precisely represent

a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

- **Comparability** is a qualitative term that expresses the measure of confidence that one dataset can be compared to another and can be combined for the decision(s) to be made.
- **Completeness** is a measure of the amount of valid data needed to be obtained from a measurement system.
- **Sensitivity** is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest.

Section 2.2.1 (Sampling Design) and *2.2.2 (Sampling Methods)* shall describe guidelines and field protocols for ensuring that these criteria are met. *Section 2.5 (Quality Control)* shall determine procedures for verifying that these criteria are met. Please note that the sensitivity data quality indicator is not relevant to the field work and primary data collection component of the QAPP.

i. GPS Data

Geographic position data shall be collected for all four projects. All GIS data produced for the five projects will adhere to the requirements of EPA's National Geospatial Data Policy (NGDP) (United States EPA, 2008). Geographic position data will be collected for the location of potential fish passage barriers; culverts, outfalls, or stormwater drainage infrastructure; boundaries of ecological communities or other important ecological features such as tidal or freshwater wetland features, boundaries of invasive plant stands/infestations, marsh ditches or channels, or top/bottom of slopes, berms, or banks; hazardous fuel accumulations; locations of utilities or other infrastructure; and potential site access/egress paths.

Precision - GPS data shall be collected with a Trimble GeoXH 6000 Series field receiver. The typical accuracy of this instrument is ± 0.5 m with post-processing. The adequacy of the accuracy of the GPS receiver for the four projects must be considered in relation to 1) the project objectives and 2) other sources of error in introduced by geographic transformation of data (less than 0.5m) and rectified aerial imagery (approximately 1m, overall accuracy and 1.5m maximum error). The conceptual restoration plans for all four projects will contain at least one plan sheet in which geographic position data is overlaid on digital aerial imagery for the project sites. Therefore, considering the precision of the GPS receiver and other error sources associated with geographic data transformation and overlaying GPS points on a rectified aerial image, the estimated maximum error of the GPS data points shall be ±2.0m. Conceptual plan sheets in which GPS positions are not overlaid on digital aerial imagery would have lower maximum error of ± 1.0m. In either case, an estimated precision of ±1.0-2.0m would be sufficient for the development of conceptual ecological restoration plans. It is estimated that a maximum error of ± 3.3m is sufficient for the preparation of these conceptual restoration plans. Final construction drawing and specifications for any of the projects would require greater precision. These final construction drawings and specifications are not a part of this project.

Bias – There are no potential sources of directional bias in the collection of geographic position data for any of the four sub-projects.

Accuracy- Considering that there are no potential sources of directional bias in the collection of geographic position data, the estimated accuracy of the geographic position data corresponds to the estimated precision of the GPS receiver described above. Accordingly, the estimated accuracy for the geographic position data is ± 1.5-2.5m and is sufficient for the development of conceptual habitat restoration plans, as described above.

Representativeness and Completeness – The collected geographic position data for all four projects shall have no deficiencies regarding representativeness or completeness. Geographic position data shall be collected for all pertinent features, described previously, within the project areas (the limits of the project areas are described in *Section 1.8*). Accordingly, the geographic position data shall be representative and complete.

Comparability - GPS data shall be collected using the World Geodetic System 1984 (WGS84), the primary map datum utilized by the Global Positioning System. Position data shall be post-processed and exported to GIS point files using ESRI (ArcGIS) GPS Analyst Extension software and compiled within the project field-data collection database. The positional data shall be transformed to Long Island State Plane Coordinate System and NAD83 datum for mapping overlay with other spatial data sets. The use of the WGS84 and NAD83 shall ensure comparability with existing and future geospatial data sets.

ii. Environmental and Site Conditions Data

Environmental and site data that may be collected for these projects would include simple in-field measurements of the dimensions of potential barriers to fish passage; culverts; outfalls; stormwater infrastructure; and wetland features such as dimensions of marsh ditches or channels, shallow stream reaches, berms, banks, height of vegetation, or depth of accumulated thatch. Environmental and site data shall be sufficiently accurate if field identification and recording of these features is correct a minimum of 99% of the time. The geographic position of these features shall be recorded with a handheld GPS receiver as discussed in *Sections 1.9.2.i and 2.1.2*. Measurements of the basic dimensions of these features shall typically be made with either a 25 ft tape measure (with 0.125 inch increments) or a graduated soundings pole (with 0.1 foot increments). These measurements may include the following: stream width above and below the potential fish barrier or culvert, stream water depth above and below the potential fish barrier or culvert, culvert dimensions, stream/channel width or depth, relative vertical distance (e.g. vertical distance between the upstream and downstream ends of a culvert), and water velocity. The estimated accuracy of these basic environmental and dimension measurements, described below, is sufficient for the development of conceptual habitat restoration plans.

Precision – The simple dimension measurements described above shall be made in the field with either a 25' tape measure (with 0.125 inch increments) or a graduated soundings pole (with 0.1 foot increments). The anticipated accuracy of these measurement tools are ± 0.12 inch and ± 0.1 foot, respectively. Relative vertical distance will be measured using a TopCon RL-H4C laser level or Nikon Total Station (Model #DTM-A5LG). The anticipated accuracy of these vertical measurements associated with the TopCon laser level, when measurements are within 100 feet of level, is ± 0.06 inches. The vertical precision of the Nikon DTM-A5LG is dictated by the accuracy of the instruments measurement of the vertical angle above or below horizontal. The

DTM-A5LG's precision for measurement of vertical angle is ± 0.0003 degrees or ± 2 seconds. At a distance of 100 ft between the total station instrument and the prism pole, this vertical angle precision results in an expected precision for elevation measurements of ± 0.02 inches. This anticipated accuracy is adequate for the development of conceptual restoration plans. The velocity upstream and downstream of any potential fish passage barrier may be measured with a Marsh McBirney Flow-Mate 2000. The measurement range of the flow meter is -0.5 to +20 ft/sec with an accuracy of ±2% of measurement reading. This anticipated accuracy is adequate for the development of conceptual restoration plans.

Bias – There are no potential sources of directional bias in the collection of the tape measure and sounding pole dimension measurements. There is a potential source of bias in the relative vertical distance measurements conducted with the Nikon Total Station as the error in vertical angle measurement will be amplified with increasing horizontal distance between the total station instrument and the prism pole. The vertical elevation error of ±0.02 inches presented above is the maximum expected error based upon 100 feet between the total station and prism pole. There is a bias in the water velocity measurements as the estimated error in precision is a constant fraction of the measurement velocity. Accordingly, the absolute error shall be greater for fast-moving water than for slow-moving waters. This bias is inconsequential for the project as the project's waterways (Stepping Stone Pond, Little Reed Pond, and Big Reed Pond outflows) have low flow velocities and flow velocity is not likely to act as a barrier to fish passage in these waterways.

Accuracy- Considering that there are no potential sources of significant directional bias in these dimensional measurements, the estimated accuracy of the dimensional measurements corresponds to the estimated precision described above.

Representativeness and Completeness – Basic environmental and dimensional data shall be collected for all pertinent features, described previously, within the project areas (the limits of the project areas are described in Section 1.8). Accordingly, the geographic position data shall be representative and complete.

Comparability – This basic dimensional data shall be recorded in standard units and shall be comparable with existing or future data. In addition, the date and time of the measurements will be recorded to facilitate comparisons with other data.

iii. Sediment Sampling and Contaminant Analysis for Iron Point

As described in *Section 1.5.2(ii*), new marsh channels may be excavated to increase tidal exchange in Iron Point marsh. Measurements of the concentrations of various contaminants in the marsh sediments is necessary to 1) determine if the sediments removed to create new marsh channels are contaminated (as defined by NYSDEC standards) and if the excavated sediments can be re-used on site or if off-site/landfill disposal would be necessary and 2) if the sediments exposed by creation of a new marsh channel would provide suitable habitat for benthic aquatic organisms.

The contaminant concentrations of the existing marsh sediments will be assessed by collection of

two (2) sediment borings in areas recommended for potential new marsh channels. Sediment borings will be up to five (5) feet in length to characterize the potential channel excavation profile. The two (2) sediment samples will be analyzed for all contaminants identified in NYSDEC TOGS 5.1.9 Table 2 and Table 375-6.8(b) of 6 NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives) (provided in Appendix C) and summarized in Table 3. The sediment samples will be analyzed by a New York State-accredited laboratory (Long Island Analytical Laboratories; Holtsville, NY) using the standard laboratory analytical methods outlined in Table 3.

Precision –
Method precision is dependent upon sampling technique and analytical method. Quantifying the precision of the sampling and analytical methods for the Iron Point sediment sampling would require collection and analysis of both field duplicate and laboratory duplicate samples. Collection of field duplicate samples and analysis of laboratory duplicate samples is not necessary nor feasible for this project due to the limited budget available for this project (and the multiple objectives and multiple project sites), the concept- or feasibility-level assessment objectives for the project, the limited number of sediment samples that will be analyzed (i.e. two samples), and the absence of a final design deliverable as part of this project.

As described below, field sampling will be as consistent as possible and will incorporate steps to avoid cross-contamination of field samples. The laboratory analysis will be completed by a New York State accredited laboratory following USEPA standard methods listed in Table 3 and following appropriate QA/QC methods.

This project aims to provide an initial, concept-level assessment of the potential contaminant concentrations in the site sediments to broadly inform constraints on sediment re-use and disposal. Additional sediment sampling and analysis will be required upon completion of the final construction design and determination of the final excavation locations and proposed cut depths. In addition, the NYSDEC will require additional sediment sampling to support the issuance of regulatory permits.

Bias – There are only limited potential sources of directional bias in the collection of the sediment samples. Failure to property clean or de-contaminate sampling equipment could bias a given sediment sample in the direction of the previous sediment sample. Methods to eliminate cross-contamination are described below in *Section 2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point).*

Accuracy-
The sediment samples will be analyzed for grain size analysis, total organic carbon content, and all analytical parameters required by the NYSDEC for evaluation of dredging or excavation in tidal wetlands including those parameters identified in Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives) (provided in Appendix A). Accuracy criteria for this sediment sampling and laboratory analyses will be the minimum standard for each analytical parameter in Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives). The analytical laboratory shall be informed of the

necessity to test to these NYSDEC regulatory standards in the submit Chain of Custody documentation submitted to the laboratory.

Table 3: Approximate Minimum Detection Limits for USEPA Methods based on previous analytical reports obtained from Long Island Analytical Laboratory (Holtsville, NY)

Contaminants	USEPA SW-846 Method	Approximate Minimum Detection Limit
Pesticides (Including Mirex)	8081A	0.5 µg/Kg
Herbicides (Including Silvex)	8151	10.0 µg/Kg
Total Aroclors of PCB's	8082	10.0 µg/Kg
Volatile Organics (VOC's)	8260B	0.5 µg/Kg
Semi-VolatileOrganics (SVOC's)	8270C	50.0 µg/Kg
Metals	6010B	0.5 mg/Kg
Hexavalent Chromium	7196A	0.5 mg/Kg
Cyanide	9012A	0.5 mg/Kg
Sieve Analysis	D422	N/A
Total Organic Carbon (TOC)	9060A	100 mg/Kg

Sampling methods to minimize potential for reduced accuracy are described in Section 2.2.3 *(Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point)* including decontamination procedures between sampling, thorough homogenization of sediment samples (except for VOC analysis), and proper storage and transport of samples at or below 4°C.

Another potential source of poor accuracy pertinent to this project is matrix interference occurring due to the complex composition of estuarine sediments, when the sample contains a contains a constituent that either produces a signal indistinguishable from a target analyte or attenuates the target signal. The analytical laboratory shall report when/if reduced accuracy occurs due to matrix interference by adding a "Data Qualifier" flag on the analytical reports for the pertinent analyte(s).

The analytical laboratory shall follow all procedures associated with the Standard Methods identified on Table 3. The laboratory shall utilize internal standards and surrogate QC samples to measure the accuracy for project samples and shall include the results from these surrogate and internal standards on the analytical reports for the sediment sampling completed for this project.

Representativeness and Completeness– As stated previously, additional sediment sampling and analysis will be needed to develop final construction plans and obtain environmental permits from regulatory agencies. Accordingly, the proposed sediment sampling will not be complete. However, the sampling will be adequate to 1) assess the feasibility of on-site re-use of sediments versus off-site/landfill disposal and suitability of sediments as habitat for benthic aquatic organisms and 2) provide guidance to Peconic Estuary Program, the municipal landowner, and project partners regarding the number and location of additional sediment sampling that will be needed during the development of construction plans and environmental permit applications.

The project study area consists of an approximately 17.5 acre tidal marsh. The selected locations of sediment borings and sediment sample collection will be chosen to be representative of the

marsh sediments that would need to be excavated to construct additional marsh channels to increase tidal flushing. Selected sediment sampling locations shall be within the excavation footprint(s) of the conceptual location of proposed marsh channel. A visual assessment of the environmental and physical characteristics of the excavation footprint(s) shall be used to determine sediment sampling locations that are representative of the larger footprint(s). Environmental and physical characteristics that shall be qualitatively evaluated to select representative sampling locations include soil and organic matter texture at the substrate surface and within 12 inches of the substrate surface, elevation and geomorphic position (i.e. panne or pond, vegetated tidal wetland with native plant community, *Phragmites* marsh, upland, or earthen berm), depositional setting, and presence or thickness of accumulated thatch. As described in *Section 2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point)*, sediments collected from the proposed dredge layer will be thoroughly homogenized (with exception of samples for VOC analysis) to ensure that sample collected for laboratory analysis is representative of sediment layer.

Comparability – The sediment sampling methods and table with standard analytical methods used for this project, and analytical results will be attached as an Appendix to the final report for the conceptual design plan for the Iron Point wetland restoration to allow those involved in any subsequent design and planning phases to replicate sediment sampling and analytical methods.

The proposed sediment sampling methods will homogenize sediments between the existing substrate surface and the proposed excavation/cut depth based on conceptual plans of proposed new marsh channels to increase comparability to the results of future sediment sampling and analysis that will be needed for final design and permitting. The laboratory analytical results are presented in mg/Kg for metals, hexavalent chromium, and cyanide and µg/Kg for all other analytical parameters (except sieve analysis/grain size and total organic carbon content). The pertinent NYSDEC standards for evaluation of dredging or excavation in tidal wetlands, i.e. Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives), are presented in ppm (equivalent to mg/Kg). Accordingly, all data summaries created from the laboratory analytical reports included in the deliverables produced for this project shall present data in ppm (i.e. mg/Kg) to increase comparability with NYSDEC standards.

iv. Secondary Data Acceptance Criteria

Secondary data used in this project includes the 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography at the Narrow River and Iron Point sites from the National Oceanic and Atmospheric Administration. The average vertical accuracy of the digital elevation model obtained from 2014 USGS Long Island New York Sandy Lidar is $\pm$ 0.86 inches vertically (USGS, 2014). The accuracy of the digital orthoimagery is $\pm$ 8 ft horizontally at the 95% confidence level. The accuracy of this GIS data from USGS is adequate for inclusion in this conceptual planning project.

It is anticipated that secondary data for a wide variety of sources shall be necessary for the completion of this project. However, at this time, secondary data that shall be used has not been identified. Due to the diversity of secondary data that shall be needed, uniform *a priori*

standards for evaluation of the acceptability of the accuracy of this data are not possible. However, the following guidelines shall be implemented to 1) evaluate the accuracy of secondary data, 2) determine if the accuracy of the secondary data is consistent with the accuracy standards for the primary data and suitable for the development of conceptual design plans, and 3) provide a record of the secondary data evaluation process. The following questions shall be answered for each secondary data source:

Who is the source of the secondary data? Is this source reliable and knowledgeable?
Did the source publish the accuracy of the data? If so, what is the expected accuracy?
Did the source publish or document the methods for the study? Was a standard or reliable method used?

The answers to the above questions shall be entered into a tabular database along with the type of data and collection dates; originating organization; and report title, author and date. Based on the answers to the above questions, a determination on the acceptability of the secondary data shall be made by the Project Manager. This evaluation and determination shall be reviewed and approved by the QA/QC Manager. The tabular database and scanned copies of the secondary data utilized for the project shall be included as an appendix of the Final Report. Hard copies of the tabular database and scanned copies of the secondary data shall be kept in the project-specific by Land Use Ecological Services until September 30, 2021 (two years after expiration of the project contract).

1.10 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Not Applicable for most of the data collection and environmental sampling, as no Special Training or Certifications are necessary for most of the environmental sampling included in this project. William Bowman has completed five on-line tutorials offered by Trimble (Sunnyvale, CA) related to operation of the Trimble GeoXH handheld GPS receiver. Kelly Risotto has completed a Graduate Certificate in Geographic Information Systems from the University of West Florida (August 2011).

Sediment analytical tests shall be completed by Long Island Analytical Laboratories (Holbrook, NY). Long Island Analytical Laboratory is a fully accredited laboratory (NYS Lab ID # 11693; USEPA ID# NY01273) certified to test solid and hazardous waste, potable and non-potable water, and air emissions in New York State.

1.11 DOCUMENTS AND RECORDS

The following project-related materials will be kept by Land Use Ecological Services until at least September 30, 2021.

- **Field Data Sheets and Notes –** will be made available to Suffolk County or the EPA representatives on the QAPP distribution list during the project period upon request.
- **Quality Assurance Project Plan** (QAPP) – describing project background, methodology, and quality assurances measures to be implemented to meet project objectives.
- **Meeting Minutes** –Minutes shall be recorded for Project Meetings and shall be circulated to

Suffolk County and the EPA Project Officer.

- **Interim Presentation on Existing Conditions and Schematic Design-** All presentation materials and supporting materials prepared for the Interim Progress Meeting.
- **Final Report on Recommendations and Conceptual Plans-** The final report and conceptual plans and all presentation material and supporting materials utilized for the Final Wrap-Up meeting.

1.12 QA PROJECT PLAN DISTRIBUTION

The most current approved Quality Assurance Project Plan (QAPP) will be distributed to all project staff listed in the Distribution List (Section 1.2). In the event that revisions or updates become necessary, a revised QAPP will be submitted to EPA for approval before additional work is begun. If additional individuals become involved in project planning and implementation, the Distribution List will be updated and the approved Quality Assurance Project Plan (QAPP) will be distributed to these individuals as well.

The most current approved QAPP will be distributed in digital format vie email, using email addresses listed in the distribution list. The Project Manager will be responsible for emailing the QAPP and making sure that all of the individuals on the distribution list have received it, and will take the lead on distributing any revisions or updates to the QAPP that may be introduced after the initial approval.

2.0 DATA GENERATION, ACQUISITION, AND ANALYSIS

Environmental data collected for this project includes geographic position data (for all four projects), basic dimensional measurements of culverts, outfall structures, and ecological features (for all four projects), and sediment sampling and laboratory analysis for the Iron Point project. This section of the QAPP explains the quality assurance procedures to be applied during the field data collection portions of the project Task 2 (*Research and Analysis*).

2.1 SAMPLING PROCESS DESIGN

2.1.1 Environmental and Site Conditions

Sites where environmental data will be collected for these four projects will be based on the location of potential barriers to fish passage (such as culverts), in-water structures that could affect hydrological processes (such as culverts and outfalls); stormwater infrastructure; and pertinent ecological features such as marsh ditches or channels, ecological community boundaries, shallow stream reaches, berms, stream/channel banks, invasive plant infestations, and accumulations of hazardous fuels. The geographic position of these features shall be recorded with a handheld GPS receiver as discussed in *Section 1.9.2.i* and *2.2.1*.

Measurements of the basic dimensions or attributes of these features shall typically be made with either a 25 ft tape measure (with 0.125 inch increments) or graduated soundings pole (with 0.1 foot increments); relative vertical distance will be measured using a TopCon RL-H4C laser level or Nikon Total Station (Model #DTM-A5LG); water velocity upstream and downstream of any

potential fish passage barrier would be measured with a Marsh McBirney Flow-Mate 2000.

Pertinent environmental and site features requiring collection of data will be based on the judgment of the primary field personnel, William Bowman, PhD of Land Use Ecological Services, Nick Nelson of Inter-Fluve, and James Remuzzi of Sustainable Solutions. Dr. Bowman has more than twenty years of experience working primarily as a wetland and terrestrial ecologist in the New York area. His areas of expertise include tidal and freshwater wetland ecology, plant physiological ecology, forest ecology, and invasive plant management. Mr. Nelson has ten years of experience in fluvial geomorphology and hydrology and works on all phases of river restoration and dam removal projects in New England and throughout the country. Mr. Remuzzi has 15 years of experience in project management, field data collection, and planning for prescribed fire and other land management projects. His clients include private landowners, non-profits, and government agencies, such as National Park Services and NRCS.

The study area for each of these projects corresponds to the study areas put forth in the Suffolk County RFP 16019 and Addendum #3 and discussed at the Project Kick-off Meeting on April 19, 2018. The study area for the Narrow River project (Southold, NY) shall consist of the area between an earthen dam and double culvert located to the east of Narrow River Road, the entirety of Broad Meadows Marsh (located between the earthen dam and Route 25), the culvert under Route 25, adjacent farmlands and adjacent reaches of Narrow River Road and Route 25, and Whitcom Park (the Town of Southold-owned property located north of Route 25). The study area for the Iron Point project (Southampton, NY) shall consist of the 17.5 acre tidal marsh and adjacent uplands contained within a polygon defined by the following four latitude/longitude positions.

Table 4: Study Area Limits for the Iron Point (Southampton, NY) Project

Boundary Point	**Latitude**	**Longitude**
ID# and Cardinal Direction	*Degrees/Minutes/Seconds*	*Degrees/Minutes/Seconds*
1-NW	40° 55’ 07.63” N	72° 37’ 37.45” W
2-NE	40° 55’ 09.23” N	72° 37’ 14.54” W
3-SE	40° 55’ 03.06” N	72° 37’ 14.77” W
4-SW	40° 54’ 59.72” N	72° 37’ 25.62” W

The study area for the Lake Montauk project consists of 1) the culvert conveying water from Stepping Stones Pond to Lake Montauk under Old West Lake Drive and an area 50-ft on either side of the conveyance ditch and 2) the culvert conveying water from Little Reed Pond to Lake Montauk under East Lake Drive, the marsh and tidal stream located downstream of the East lake Road culvert, the culvert conveying water out of Big Reed Pond, the existing ditch within the ~8 acre *Phragmites* marsh separating the Big Reed Pond culvert from the open waters associated with Little Reed Pond, the existing ~450-ft ditch between the Big Reed Pond culvert and open waters of Big Reed Pond, and Big Reed Pond.

The study area for the Main Road, MH-2 Wetland project (Riverhead, NY) includes the 2.61 acre Town of Riverhead-owner property at 705 Main Road in Aquebogue (SCTM#: 600-67-2-

27) and the reach of Main Road (and its right-of-way) located immediately north of the subject property.

The environmental data for these projects shall be collected between July and September 2018. All necessary environmental data can be adequately collected during this time period.

2.1.2: Sediment Sampling and Contaminant Analysis for Iron Point

As described in *Section 1.5.2(ii*) *(Iron Point Wetland Restoration)*, two (2) sediment borings will be collected and analyzed for sediment contaminant concentrations to 1) assess the feasibility of on-site re-use of excavated sediments or off-site/landfill disposal and 2) provide a concept plan-level analysis of the suitability of sediments exposed by creation of a new marsh channel as habitat for benthic aquatic organisms. Additional sediment sampling and analysis will be needed to develop final construction plans and obtain environmental permits from regulatory agencies.

The sediment borings collected will be within the tidal marsh within the Study Area defined in *Section 2.1.1 (Environmental and Site Conditions)*. At this time, the sediment sampling locations are not known. Sediment sampling locations will correspond to locations recommended for potential new marsh channels and boring depth will correspond to proposed excavation/cut depths identified on prepared conceptual plans to increase comparability of these results to the results of future sediment sampling and analysis that will be needed for final design and permitting. PEP and project stakeholder review and comment on the Schematic Design for this project will be incorporated into sediment sampling locations. Accordingly, the sediment sampling will be conducted after the Interim Progress Meeting and between November 15, 2018 and January 15, 2019. There are no seasonal constraints associated with sediment sampling and analysis; therefore, all proposed sediment sampling can be adequately performed during this time period.

2.2 SAMPLING METHODS

2.2.1 Collection of GPS Data

All GIS data collected will adhere to the requirements of EPA's National Geospatial Data Policy (NGDP) (United States EPA, 2008). GPS data will be collected using a Trimble GeoXH 6000 Series receiver and post-processed to attain the expected ± 0.5-1.0 m accuracy. Field receiver shall be logged and recorded in the field using TerraSync 5.0 software. Field GPS data shall be collected by William Bowman, PhD. The following data acquisition standards and methods shall be utilized to attain the expected GPS receiver accuracy.

Control Configurations - Following the manufacturer's recommendations, GPS receiver shall be set to operate using the *Smart Settings* option for GNSS or the following custom GNSS settings:

- Use Integrated SBAS (satellite based augmentation system) for real-time data correction.
- Use Real-Time corrected GNSS with a Real-Time Data Age Limit of 1 minute.
- Data shall be collected for 0.33-1.0 minutes at 1-2 second intervals to obtain a

minimum of 10-20 data points per data point.

- Only PDOP (Dilution of Precision) values between less than or equal to 6 shall be used. PDOP values greater than 6 may result in measurement inaccuracy of 1m or more.
- Only HDOP (Horizontal Dilution of Precision) values less than or equal to 4 shall be used.
- Only satellite signals with a SNR (Signal to Noise Ratio) of greater than 6 shall be used for data.
- Only satellites positioned more than 15º above the horizon shall be used. This angle shall minimize signal shadow from topography, trees, and buildings.
- Data shall not be collected if less than five satellites are visible to the GPS receiver.

Satellite Obstruction Due to Building or Tree Shading **-** GPS receiver operator shall hold receiver at arm's length away from the body (to avoid satellite signal shading) and at a height of 1.2 m above the ground or a Trimble Tornado antenna shall be used. Correct antennae elevation settings shall be checked daily prior to use of GPS receiver. Operator shall stand to the north of the GPS receiver to prevent obstruction of satellites located in the southern sky and vice versa.

Control or Reference Points- At least three control or reference points shall be collected during each full day of field data collection (including at the beginning and end of the day) by obtaining a GPS position at a known location or feature.

Battery Maintenance **-** The Trimble GeoXH battery capacity permits 10 hours of operation on a single charge. Receiver battery shall be charged each night prior to scheduled field data collection activities. A back-up (and fully charged) battery shall be brought into the field for all GIS data collection.

2.2.2 Collection of Environmental and Dimensional Data

Environmental and site data collected for the Narrow River, Iron Point, Lake Montauk, and Main Road MH-2 projects could include simple in-field measurements of the dimensions of potential barriers to fish passage; culverts; outfalls; stormwater infrastructure; and wetland features such as dimensions of marsh ditches or channels, shallow stream reaches, berms, banks, height of vegetation, or depth of accumulated thatch. The geographic position of these features shall be recorded with a handheld GPS receiver as discussed in *Sections 1.9.2.i* and *2.1.2*. Measurements of the basic dimensions of these features shall typically be made with either a 25 ft tape measure (with 0.125 inch increments) or a graduated soundings pole (with 0.1 foot increments). These measurements may include the following: stream width above and below the potential fish barrier or culvert, stream water depth above and below the potential fish barrier or culvert, culvert dimensions, stream/channel width or depth, relative vertical distance (e.g. vertical distance between the upstream and downstream ends of a culvert), and water velocity. These measurements shall be conducted as follows:

Stream/Waterway Width- Stream width and stream channel width shall be measured above and below each potential barrier. In many cases, the stream is actually a man-made channel,

ditch, or other narrow waterway. The term "stream" is used for simplicity. Stream width and stream channel width shall be measured immediately adjacent to the potential barrier provided that this width is representative of the stream width found 25' upstream and downstream of the barrier. If the stream width varies by more than 25% in the 25' upstream and downstream of the barrier, then additional stream width measurements (and distance upstream and downstream of the barrier) shall be collected to account for this variability. This measurement shall be made with the 25' measurement tape. To measure stream channel width, the tape shall be held or staked at the bottom of the stream bank and then stretched across the stream to the bottom of the opposite stream bank. To measure stream width, the tape shall be held or staked at the water's edge and then stretched across the stream to the water's edge on the opposite side of the stream. Measurements shall be recorded to the nearest 0.25 inch.

Stream/Waterway Water Depth- Water depth shall be measured at the stream mid-point and halfway between the stream mid-point and the water's edge at each bank. Measurements shall be made with a graduated sounding pole. Measurements shall be recorded to the nearest 0.1 foot. It is acknowledged that in-stream water depth will vary considerably due to variation in groundwater elevation and precipitation. These water depth measurements collected during field inspections are not continuous or replicated; therefore, these measurements are not representative of the wide range of flow depths possible. Continuous or replicated measurements of water depth are not necessary for this project as 1) water depth is not being measured as a quantitative criteria for evaluating fish passage, as alewives can migrate upstream in streams with water as shallow as 1.2-4.2 inches in depth (Maine Department of Transportation, 2004) and 2) relative vertical distance measurements will also be collected.

Culvert or Outfall Dimensions- The width, height, and water depth within a culvert or stormwater outfall shall be measured with a 25' tape measure or graduated sounding pole both at the upstream and downstream ends of the culvert. Measurements shall be recorded to the nearest 0.125 inch or 0.1 foot depending on whether a tape measure or graduated sounding pole is utilized for the measurement. For cylindrical culverts, water depth shall be measured between the nadir of the culvert and the water level at the time of the field inspection. The water depth shall also be measured between the nadir of the culvert and any permanent water marks on the sides of the culvert, if water level is below these water marks during the time of field inspection.

Water Velocity- The water velocity upstream and downstream of each potential fish barrier shall be measured with a Marsh McBirney Flow-Mate 2000. The measurement range of the flow meter is -0.5 to +20 ft/sec with an accuracy of ±2% of measurement reading. For culverts, water velocity shall also be measured within the culvert. Water velocity shall be made in the deepest portion of the stream channel to record maximum velocity within the stream channel. Similar to water depth measurements, stream water velocity will vary considerably due to variation in groundwater elevation and precipitation. These water velocity measurements collected during field inspections are not continuous or replicated; therefore, these measurements are not representative of the wide range of flow conditions possible. Continuous or replicated measurements of water depth are not necessary for this project as high stream water velocity is not likely to be acting as a barrier to fish passage in the subject stream systems.

Relative Vertical Distance – Relative vertical distance will be measured in various settings for

this project including 1) quantifying the vertical distance between the upstream and downstream ends of a culvert, 2) developing a cross-section profile of an earthen berm or marsh channel or ditch, 3) developing cross-section profiles on natural or man-made slopes featuring transitions between wetland and upland communities, and 4) developing longitudinal section profiles of existing conditions from an outfall (i.e Main Road MH-2 site) or culvert (i.e. Stepping Stones Pond) to the downstream, receiving waterbody or wetland. Relative vertical distance will be measured using a TopCon RL-H4C laser level or Nikon Total Station (Model #DTM-A5LG). The anticipated accuracy of these vertical measurements associated with the TopCon laser level, when measurements are within 100 feet of the instrument, is ± 0.06 inches. The vertical precision of the Nikon DTM-A5LG is dictated by the accuracy of the instruments measurement of the vertical angle above or below horizontal. The DTM-A5LG's precision for measurement of vertical angle is ± 0.0003 degrees or ± 2 seconds. At a distance of 100 ft between the total station instrument and the prism pole, this vertical angle precision results in an expected precision for elevation measurements of ± 0.02 inches.

The laser level or total station shall be stationed at the upper (i.e. higher elevation) position and the graduated pole or rod stationed at the lower position. A graduated sounding pole or rod (with 0.1 foot increments) shall be used to measure the height of the total station or laser level above the ground surface and recorded to the nearest 0.1 foot. During measurements of relative vertical distance where the lower position features soft or unconsolidated sediments, care will be taken to place the graduated pole or rod gently on the sediment surface so that the lower end of the pole/rod is not pressed below the sediment surface. Similarly, if the lower position features accumulated plant biomass, duff, or thatch, the depth of this accumulated biomass will be recorded and gently removed. The lower end of the pole/rod will then be placed on the actual sediment surface.

The geographic position of both the upper and lower positions shall be recorded as necessarywith a handheld GPS receiver as discussed in Section 1.9.2.i and 2.1.2.

To ensure accurate measurements of vertical elevation the following procedures shall be utilized:

- The legs of the tripod used to support the instrument shall be pressed firmly into the ground to anchor the tripod securely prior to leveling of the instrument.
- The instrument shall be properly leveled using the instrument's optical plummet and bubble level. Air bubbles within the optical plummet and level shall be adequately within the reticle mark or level lines, respectively.
- The instrument battery shall be fully charged prior to commencement of field work.. The instrument battery allows for an operating time of approximately 4 hours. Accordingly, a spare charged battery shall be brought into the field to replace the initial battery.
- The distance between upper and lower positions (i.e. between laser level or total station and graduated rod/prism pole) shall be sufficiently small that the light intensity from the laser level or reflected from the prism is sufficient to collect accurate measurements.

2.2.3 Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point

Two sediment cores will be collected at locations corresponding to recommended locations for new marsh channels. The sediment cores shall be collected using a multi-stage sediment sampler or geoprobe operated from the sediment surface. A supply list for sediment sampling for the Iron Point project is provided in Appendix C. The cores shall extend twelve inches below the recommended excavation depth associated with the new marsh channel.

Each core will be logged for soil characteristics in the field using the United States Geological Survey (USGS) Unified Soil Classification system. Each sediment sample core will be inspected for visibly distinct layers. Only the sediments between the sediment surface and the proposed excavation depth will be sampled and analyzed for contaminant concentrations. This sample shall be referred to as Segment A (excavation sample).

After collection of each core and identification of Segment A (excavation sample), a grab sample will be collected from Segment A for each sampling location yielding two (2) samples for VOC analysis. The remaining Segment A material from each core shall be homogenized (or well-mixed within a plastic bucket) and composited into a single sample for laboratory analysis for the other parameters listed in Table 3. Sediment from the individual cores from different sampling locations will not be composited.

Sediment sampling equipment shall be decontaminated between collection of sediment samples using phosphate-free laboratory detergent, such as Liquinox by Alconox (Jersey City, NJ) or equivalent, with appropriate long-handled scrub brushes or bottle brushes, tap water, and plastic buckets. Decontamination shall be completed on a plastic sheet or tarp laid upon the ground surface. Water used for decontaminated sampling equipment shall not be dischargeD proximal to the subsequent sediment sampling location.

Sample containers will be supplied by the testing laboratory. The containers will be laboratory cleaned, pre-preserved and sealed with the appropriate documentation. All sample containers will be labeled using a permanent marker to indicate the date, time, sample location, and sample identification number. This information will also be recorded in a field log book and on a chain of custody form that will follow the samples. Once each sample container is filled, capped and labeled, it will be appropriately packaged to prevent breakage and placed in an ice-filled insulated cooler, maintained at a temperature of 4° C, until the samples are delivered to the laboratory within 24 hours of collection.

Sample numbering shall be formatted as follows:

Each sample segment will be given a sample test number according to the format **IP/C#/CS#**, where:
IP = Iron Point
C# = Core Number 1 or 2
CS = Core Segment: (A) material to be excavated

QUALITY ASSURANCE AND QUALITY CONTROL

Laboratory QA/QC procedures will be consistent with the requirements outlined in Appendix C of the NYSDEC *In-Water and Riparian Management of Sediment and Dredged Material* (TOGS

5.1.9). Testing will be conducted in accordance with the following procedures and methods (Table 5):

Table 5. Procedures and Methods for Sediment Sample Testing.

Contaminants	USEPA SW-846 Method
Pesticides (Including Mirex)	8081A
Herbicides (Including Silvex)	8151
Total Aroclors of PCB's	8082
Volatile Organics (VOC's)	8260B
Semi-VolatileOrganics (SVOC's)	8270C
Metals	6010B
Hexavalent Chromium	7196A
Cyanide	9012A
Sieve Analysis	D422
Total Organic Carbon (TOC)	9060A

The following information shall be collected and documented on an appropriate data sheet and submitted with the test results: field conditions, weather conditions, name of sampler, sample designation, collection method, soil description, photographs, and any pertinent information that may bear influence on sample analysis.

Samples shall remain in the custody of the sampler from the time the samples are taken through the delivery to the New York State-certified testing laboratory (Long Island Analytical Laboratories, Holbrook, NY). Custody will be transferred in compliance with all applicable standards. Care will be taken to ensure that all samples are uniquely identified, vital sample characteristics are preserved, correct samples are tested and traceable to their source, samples are protected from loss and/or damage, and sample information is recorded on a sample label that corresponds to a chain-of-custody form. A chain-of-custody form shall be completed for each sample in order to provide an accurate record that traces the possession and handling of each sample from the time of collection through performance of the analyses. Sample analysis and completion of laboratory analytical reports is expected within 14 days of sample delivery.

SAMPLE ANALYSIS

Segment A (see above) will be analyzed for grain size analysis, total organic carbon content, and all parameters identified in Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives). The Segment A grab sample will be used for VOC analysis and the Segment A composite sample for all non-VOC parameters including grain size and total organic carbon content. The methods of investigation, summary of findings and conclusions will be summarized in the *Final Conceptual Plan and Recommendations* report submitted to the PEP. The report will include soil boring logs, lab data sheets, and data summary tables.

2.3 SAMPLE HANDLING AND CUSTODY

Sampling handling and custody procedures are only applicable to the collection of sediment

samples for the Iron Point project and are described above in Section *2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point*).

2.4 ANALYTICAL METHODS

Analytical methods are only applicable to the collection of sediment samples for the Iron Point project and are described above in Table 5 in Section *2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point*).

2.5 QUALITY CONTROL

GPS Data - Following data correction, all features having a GPS-derived geometry shall be validated to ensure that each feature meets the accuracy requirements specified in Section 1.9.2-*Primary Data Acceptance Criteria* (3.3 m). During validation, the estimated accuracy of a GPS-derived feature is compared to the required accuracy. If the estimated accuracy is larger than the required accuracy, the feature is invalid. Each invalid feature listed in the GPS Feature Validation window shall be manually reviewed by project and QA/QC managers for compliance with precision standards and to determine if invalid features shall be edited, rebuilt, or deleted from the data set. In addition, at least three control or reference points shall be collected during each full day of field data collection (including at the beginning and end of the day) by obtaining a GPS position at a known location or feature.

Sediment Sampling and Laboratory Analysis for Iron Point- Please refer to *Section 2.2.3 for Quality Control procedures.*

2.6 INSTRUMENT TESTING, INSPECTION AND MAINTENANCE

According to Trimble, the GeoXH GPS receiver – that will be utilized for the field work – does not require a periodic testing or inspection program. GPS position data collection and processing is performed in a digital manner within the receiver through a microprocessor that is pre-programmed by the manufacturer. The only required maintenance of the GPS receiver entails software updates via download from the Trimble web site. Such updates incorporate software code enhancements by Trimble to improve device operation and any operational changes in the GPS satellite network. Land Use incorporate any updates to the GeoXH GPS; update notifications are provided automatically whenever the GPS receiver is connected to a desktop PC or laptop for download of position data.

The instrument constant of the Nikon Total Station shall be checked within 48 hours prior to the commencement of data collection to ensure that the instrument is performing properly. The manufacturer recommends that the instrument constant be checked several times per year. This is done by checking the accuracy of the horizontal distance estimate of the instrument against a known length such as a 200 ft tape measure.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

As discussed in Section 2.6 above, the GeoXH GPS receiver is a digital (i.e., non-analog) device which operates via a microprocessor; it is programmed for self-calibration as necessary. As such,

it does not require any manual calibration by the user. Updates to the GPS receiver software are incorporated when indicated by an automated download from the Trimble web site as discussed in Section 2.6.

The Nikon DTM-A5LG Total Station was adjusted and calibrated in June 2011 and received a National Institute of Standards and Technology (NIST) Certificate of Compliance with the instrument's stated accuracy and tolerances.

2.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Not Applicable

2.9 DATA MANAGEMENT

As stated previously, the written draft Final Report shall be delivered to the County and Peconic Estuary Program (PEP) Office at least two weeks prior to the Final Wrap-Up meeting where the Final Presentation of our findings, recommendations, and conceptual plans will be delivered to the County and stakeholders. The Final Report shall contain all relevant written materials, field data, maps, schematic plans, conceptual plans, and supporting digital data files developed during the completion of Tasks 2-4. Ten (10) hard color copies of the Final Report shall be provided and five (5) CDs containing a PDF of the Final Report and all associated data, files, maps, plans, digital data files, etc.

GPS Data - Field GPS data shall be exported from the GPS receiver into a Personal Geodatabase using ArcCatalog, corrected using the Differential Correction Wizard in ArcCatalog, and Validated using the GPS Feature Validation Tool in ArcMap. GPS data files shall be downloaded from the Trimble GPS receiver to a desktop computer equipped with TerraSync 5.1, GPS Analyst Extension, and ESRI ArcMap 10.0 software within 48 hrs of collection of data. Data collected by the Trimble GPS receiver is stored as an .SSF file. These files shall be imported into a Personal Geodatabase having the following properties:

- GPS-enabled
- Spatial Reference: NAD_1983_StatePlane_New_York_Long_Island_FIPS_3104_Feet. Note: Minimum z domain value shall be set to negative value as recommended for low-lying coastal areas in Trimble GPS Analyst Extension guidelines.
- Geographic Transformation: WGS_1984 to NAD_1983_StatePlane_New_York_Long_Island_FIPS_3104_Feet using WGS_1984_LITRF007_to_NAD_1983.

As described in Section 2.1.2 (Sampling Methods), data shall be postprocessed using the Differential Correction wizard to obtain anticipated 0.5m accuracy or better.

After data export, the back-up data file shall also be updated. GPS data shall be reviewed by the project and QA/QC managers for compliance with precision standards.

Site Photos

All photos taken at field sites shall include time stamps with date and time that the image was collected. The following file-naming convention shall be used for all photos collected for this project.

Each photo/image file will be named and saved according to the format
Site_Year Month Day_Time, where:
Site = NR for Narrow River, IP for Iron Point, SS for Stepping Stones Pond, BR for Big Reed Pond, MH for Meetinghouse Creek
Year = Four Digit Year
Month = Two Digit Year
Day = Two Digit Day
Time = Four Digit Time (24-hr Clock)

Environmental Data (including Laboratory Analytical Reports) for Narrow River Road, Iron Point, Lake Montauk, and Main Road MH-2 Projects

Field data sheets shall be developed for each project and completed during field investigations. Example field data sheets that may be used for stream reach assessments and wetland delineation and characterization are provide in Appendix E. All dimensional measurements, water velocities measurements, and other field notes shall be recorded on field data sheets. Field data sheets shall be photocopied and scanned within 48 hours of collection of data. Field data sheets shall not be transcribed. Original hand-written records/data sheets shall be scanned and maintained. Scanned copies of field datasheets shall be transferred to both project file and back-up file. Hard copies of data sheets shall be kept in a project specific binder by Land Use Ecological Services until at least September 30, 2021. All laboratory analytical reports for the Iron Point sediment samplings will also be kept as electronic files in both the project file and back-up file. Hard copies of laboratory analytical reports shall be kept in the project specific binder by Land Use Ecological Services until at least September 30, 2021.

3.0 ASSESSMENT AND OVERSIGHT

3.1 ASSESSMENTS AND RESPONSE ACTIONS

The environmental data collection component of each restoration projects is expected to take 1-4 days for each project. Due to the short period of time for the environmental data collection, it is not practical to have interim assessments of the environmental data collection procedures. Accordingly, the QA Manager at Land Use Ecological Services, Kelly Risotto, will conduct the Quality Control procedures described in Section 2.5 and will assess the field data sheets to ensure compliance with methodological procedures described in Section 2.4. If this assessment is deemed unsatisfactory then the environmental data collection shall be re-done or augmented, as necessary. The results of this assessment (and the date of the assessment) will be transmitted to the EPA Project Officer, the EPA QA Officer, and the Suffolk County Department of Health Services Project Manager. Any significant changes to procedures due to such assessments and

any non-compliance issues encountered will be reported to the EPA Project Officer and the EPA QA Officer and the Suffolk County Department of Health Services Project Manager. Should revisions or additions to the QAPP become necessary due to significant reported QA deficiencies or for any other reason, Land Use Ecological Services will submit a revised QAPP to EPA for approval.

3.2 REPORTS TO MANAGEMENT

The assessment of the environmental data collection and results of this assessment shall be sent to the EPA Project Officer, the EPA QA Officer, and the Suffolk County Department of Health Services Project Manager. No other additional QA-related reports are expected to be needed for this project. All other final reports and project deliverables are listed in Section 1.11: Documents and Records.

4.0 DATA VALIDATION AND USABILITY

4.1 DATA REVIEW, VERIFICATION AND VALIDATION

For the field data collected, data quality and assessment standards are described in Sections 1.9.2 (Data Acceptance Criteria), 2.2 (Sampling Procedures), and 3.1 (Assessments and Response Actions).

4.2 VERIFICATION AND VALIDATION METHODS

Field data will be verified by the QA Manager, who will examine field notebooks and datasheets to assess whether all QA processes were followed in accordance with this QAPP. Examination of field notebooks and datasheets shall be examined within a week of the first field data collection and then monthly until completion of the project. Data will be validated by determining whether it achieved the precision and accuracy goals listed above. Any data that could not be validated or verified will not be included in the final analysis and reports.

4.3 RECONCILIATION WITH USER REQUIREMENTS

There are no specific user requirements for the collected data; however, the sampling design has considered maximizing the potential for comparisons with existing and future data as discussed in the Comparability portion in Section 1.9.2 (Data Acceptance Criteria).

5.0 LITERATURE CITED

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APPENDIX A:
Location Maps for Project Sites

Town of Southold Parcel
Suffolk County Parcel
New York State Parcel
Private Parcel
Preliminary Study Area

NOTES:
1. 2016 parcel data from Suffolk County Real Property Tax Service Agency, used with permission.
2. 2016 orthoimage from NYS GIS Clearinghouse (gis.ny.gov).

N
1 in = 300 ft
0 80 160 320
Feet

Land Use Ecological Services, Inc

Prepared By: Land Use Ecological Services, Inc.
570 Expressway Drive South, Suite 2F
Medford, NY 11763

Project: Narrow River - Town of Southold
For: Peconic Estuary Program

Date: 3/20/2018 | Revised: | Scale: As Noted | Sheet: Base

NOTES:
1. 2016 orthoimage from NYS GIS Clearinghouse (gis.ny.gov).

N

1 in = 200 ft

0 50 100 200 Feet

Land Use Ecological Services, Inc

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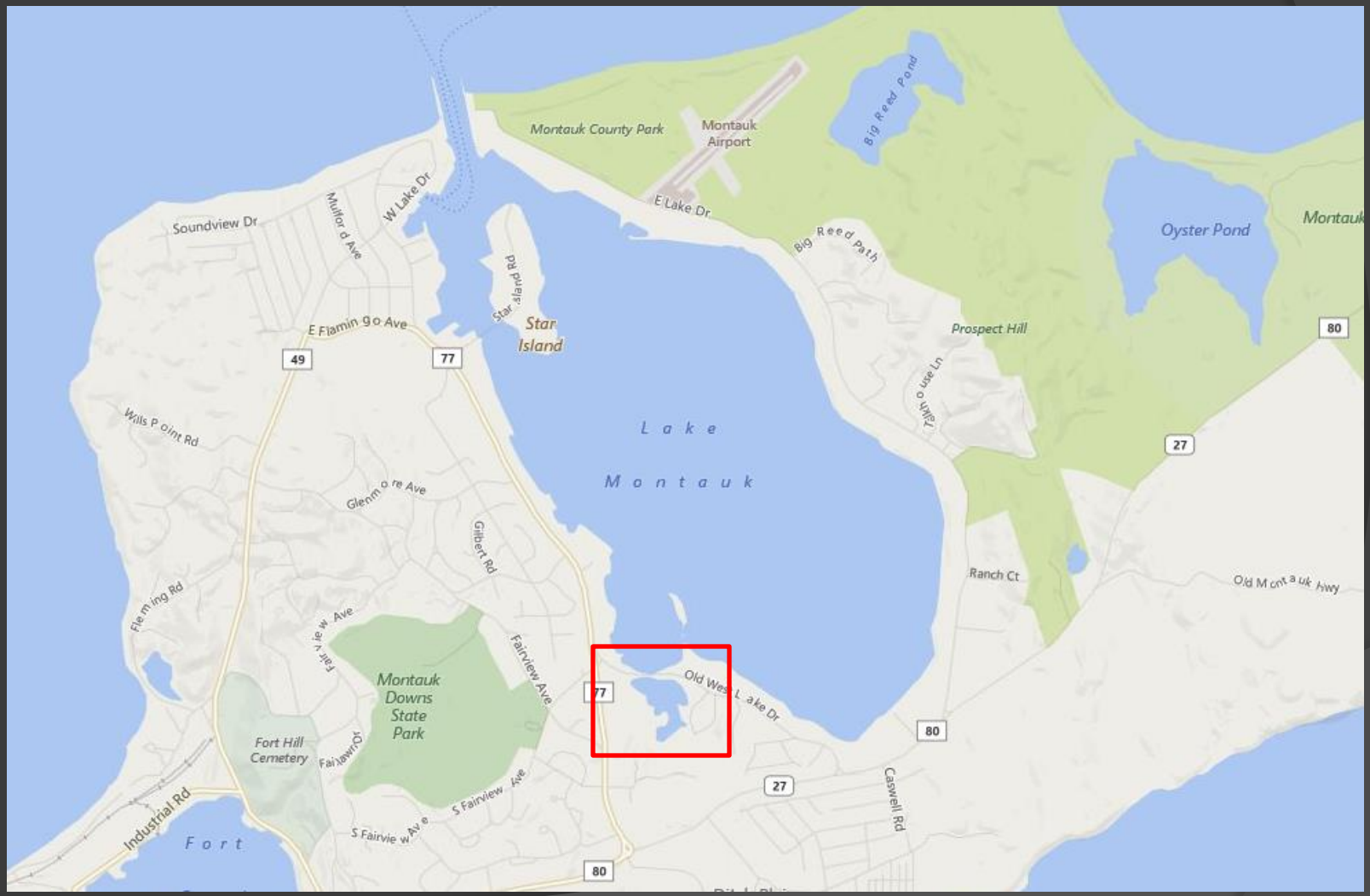
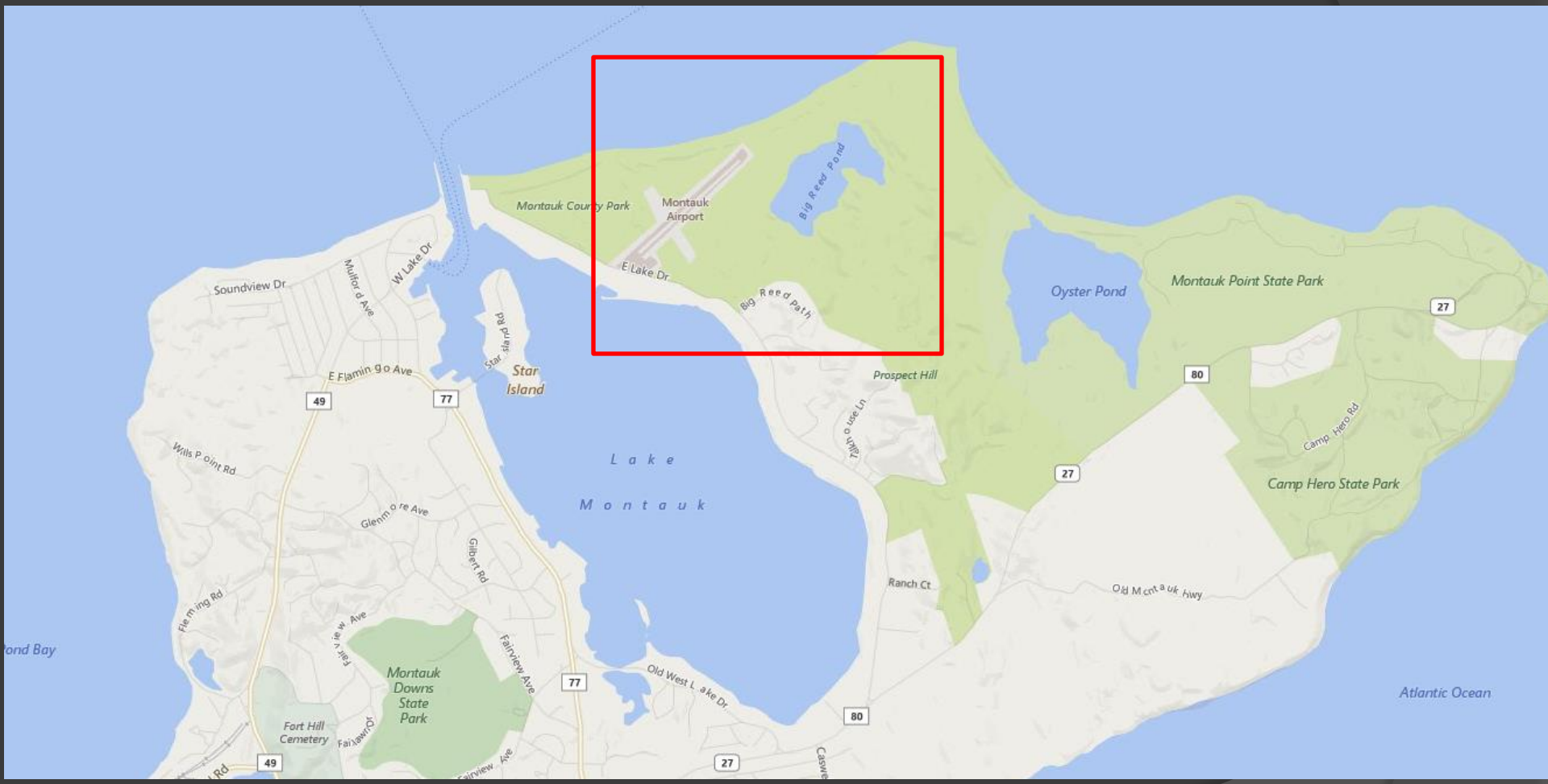
570 Expressway Drive South, Suite 2F
Medford, NY 11763
Drawn By: K. Risotto

Project: Iron Point - Town of Southampton
For: Peconic Estuary Program

Date: 3/20/2018	Revised:	Scale: As Noted	Sheet: Base Map

Stepping Stones Pond




Montauk County Park
Montauk Airport
Big Reed Pond
E Lake Dr
Big Reed Path
Oyster Pond
Montauk Point State Park
Soundview Dr
Multford Ave
W Lake Dr
Star Island
Star Island Rd
E Flamingo Ave
49
77
Prospect Hill
Old Montauk Hwy
27
80
Camp Hero Rd
Camp Hero State Park
Wills Point Rd
Lake Montauk
Glenmore Ave
Gilbert Rd
Fleming Rd
Fairview Ave
Montauk Downs State Park
Fort Hill Cemetery
Old West Lake Dr
Ranch Ct
Old Montauk Hwy
Atlantic Ocean

NOTES:
1. 2016 orthoimage from NYS GIS Clearinghouse (gis.ny.gov).

N
1 in = 100 ft
0 25 50 100
Feet

Land Use
Ecological Services, Inc.

Prepared By: Land Use Ecological Services, Inc.
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Project: Main Road - Town of Riverhead
For: Peconic Estuary Program

Date: 3/20/2018 | Revised: | Scale: As Noted | Sheet: Base Map

APPENDIX B:
General Location Map for Iron Point Reactive Barrier Project

Figure 2. Conceptual research-based permeable reactive barrier (black line) and cluster well monitoring upgradient and downgradient (blue Dots) . All well points will be flush with the surface and the reactive barrier is subsurface (>5' below the surface). Note that the location of the reactive barrier will be determined from well data and other factors, and is likely to change in the design phase.

APPENDIX C:
NYSDEC TOGS 5.1.9 and
Table 375-6.8(b) of 6NYCRR Part 375
(Environmental Remediation Programs:
Remedial Program Soil Cleanup Objectives

Department of Environmental Conservation

Division of Environmental Remediation

6 NYCRR PART 375

Environmental Remediation Programs

Subparts 375-1 to 375- 4 & 375-6

Effective December 14, 2006

New York State Department of Environmental Conservation

(b) Restricted use soil cleanup objectives.

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Metals							
Arsenic	7440-38-2	16[f]	16[f]	16[f]	16[f]	13[f]	16[f]
Barium	7440-39-3	350[f]	400	400	10,000 [d]	433	820
Beryllium	7440-41-7	14	72	590	2,700	10	47
Cadmium	7440-43-9	2.5[f]	4.3	9.3	60	4	7.5
Chromium, hexavalent [h]	18540-29-9	22	110	400	800	1[e]	19
Chromium, trivalent [h]	16065-83-1	36	180	1,500	6,800	41	NS
Copper	7440-50-8	270	270	270	10,000 [d]	50	1,720
Total Cyanide [h]		27	27	27	10,000 [d]	NS	40
Lead	7439-92-1	400	400	1,000	3,900	63[f]	450
Manganese	7439-96-5	2,000[f]	2,000[f]	10,000 [d]	10,000 [d]	1600[f]	2,000[f]
Total Mercury		0.81[j]	0.81[j]	2.8[j]	5.7[j]	0.18[f]	0.73
Nickel	7440-02-0	140	310	310	10,000 [d]	30	130
Selenium	7782-49-2	36	180	1,500	6,800	3.9[f]	4[f]
Silver	7440-22-4	36	180	1,500	6,800	2	8.3
Zinc	7440-66-6	2200	10,000 [d]	10,000 [d]	10,000 [d]	109[f]	2,480
PCBs/Pesticides							
2,4,5-TP Acid (Silvex)	93-72-1	58	100[a]	500[b]	1,000[c]	NS	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 [e]	17
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 [e]	136
4,4'- DDD	72-54-8	2.6	13	92	180	0.0033 [e]	14
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04[g]	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09
Chlordane (alpha)	5103-71-9	0.91	4.2	24	47	1.3	2.9

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
delta-BHC	319-86-8	100[a]	100[a]	500[b]	1,000[c]	0.04[g]	0.25
Dibenzofuran	132-64-9	14	59	350	1,000[c]	NS	210
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1
Endosulfan I	959-98-8	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan II	33213-65-9	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan sulfate	1031-07-8	4.8[i]	24[i]	200[i]	920[i]	NS	1,000[c]
Endrin	72-20-8	2.2	11	89	410	0.014	0.06
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1
Polychlorinated biphenyls	1336-36-3	1	1	1	25	1	3.2
Semivolatiles							
Acenaphthene	83-32-9	100[a]	100[a]	500[b]	1,000[c]	20	98
Acenapthylene	208-96-8	100[a]	100[a]	500[b]	1,000[c]	NS	107
Anthracene	120-12-7	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benz(a)anthracene	56-55-3	1[f]	1[f]	5.6	11	NS	1[f]
Benzo(a)pyrene	50-32-8	1[f]	1[f]	1[f]	1.1	2.6	22
Benzo(b)fluoranthene	205-99-2	1[f]	1[f]	5.6	11	NS	1.7
Benzo(g,h,i)perylene	191-24-2	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benzo(k)fluoranthene	207-08-9	1	3.9	56	110	NS	1.7
Chrysene	218-01-9	1[f]	3.9	56	110	NS	1[f]
Dibenz(a,h)anthracene	53-70-3	0.33[e]	0.33[e]	0.56	1.1	NS	1,000[c]
Fluoranthene	206-44-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Fluorene	86-73-7	100[a]	100[a]	500[b]	1,000[c]	30	386
Indeno(1,2,3-cd)pyrene	193-39-5	0.5[f]	0.5[f]	5.6	11	NS	8.2
m-Cresol	108-39-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
Naphthalene	91-20-3	100[a]	100[a]	500[b]	1,000[c]	NS	12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
o-Cresol	95-48-7	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
p-Cresol	106-44-5	34	100[a]	500[b]	1,000[c]	NS	0.33[e]
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8[e]	0.8[e]
Phenanthrene	85-01-8	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Phenol	108-95-2	100[a]	100[a]	500[b]	1,000[c]	30	0.33[e]
Pyrene	129-00-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Volatiles							
1,1,1-Trichloroethane	71-55-6	100[a]	100[a]	500[b]	1,000[c]	NS	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27
1,1-Dichloroethene	75-35-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33
1,2-Dichlorobenzene	95-50-1	100[a]	100[a]	500[b]	1,000[c]	NS	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02[f]
cis-1,2-Dichloroethene	156-59-2	59	100[a]	500[b]	1,000[c]	NS	0.25
trans-1,2-Dichloroethene	156-60-5	100[a]	100[a]	500[b]	1,000[c]	NS	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1[e]	0.1[e]
Acetone	67-64-1	100[a]	100[b]	500[b]	1,000[c]	2.2	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06
Butylbenzene	104-51-8	100[a]	100[a]	500[b]	1,000[c]	NS	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76
Chlorobenzene	108-90-7	100[a]	100[a]	500[b]	1,000[c]	40	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1
Hexachlorobenzene	118-74-1	0.33[e]	1.2	6	12	NS	3.2
Methyl ethyl ketone	78-93-3	100[a]	100[a]	500[b]	1,000[c]	100[a]	0.12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Methyl tert-butyl ether	1634-04-4	62	100[a]	500[b]	1,000[c]	NS	0.93
Methylene chloride	75-09-2	51	100[a]	500[b]	1,000[c]	12	0.05
n-Propylbenzene	103-65-1	100[a]	100[a]	500[b]	1,000[c]	NS	3.9
sec-Butylbenzene	135-98-8	100[a]	100[a]	500[b]	1,000[c]	NS	11
tert-Butylbenzene	98-06-6	100[a]	100[a]	500[b]	1,000[c]	NS	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3
Toluene	108-88-3	100[a]	100[a]	500[b]	1,000[c]	36	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6
1,3,5- Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02
Xylene (mixed)	1330-20-7	100[a]	100[a]	500[b]	1,000[c]	0.26	1.6

All soil cleanup objectives (SCOs) are in parts per million (ppm).
NS=Not specified. See Technical Support Document (TSD).

Footnotes

[a] The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

[b] The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

[c] The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

[d] The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

[e] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

[f] For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.

[g] This SCO is derived from data on mixed isomers of BHC.

[h] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[i] This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.

[j] This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See TSD Table 5.6-1.

375-6.9 Development or modification of soil cleanup objectives.

(a) Applicability. This section identifies when and the procedures under which a contaminant-specific soil cleanup objective may be developed or modified.

(1) Soil cleanup objectives for contaminants not included in Tables 375-6.8(a) and (b) may be developed by the remedial party or required by the Department.

(2) Soil cleanup objectives for contaminants included in Tables 375-6.8(a) and (b), may be modified based on site-specific data if desired by the remedial party; as set forth in:

(i) subpart 375-3 for Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(iii) and subparagraph 375-4.8(c)(1)(iii).

(3) Protection of ecological resources soil cleanup objectives were not developed for certain contaminants, which are identified in Table 375-6.8(b) as "NS". Where such contaminants:

(i) appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources soil cleanup objective for the contaminant for use in Track 1 and apply such soil cleanup objective where it is lower than the soil cleanup objective set forth in Table 375-6.8(a); or

(ii) are identified as impacting or threatening an ecological resource for a restricted use remedial program the Department may require a protection of ecological resources soil cleanup objective be developed.

(b) New soil cleanup objectives must:

(1) Be developed utilizing the same methodologies that were used by the Department to develop the respective soil cleanup objective, as provided in the Technical Support Document.

(2) Apply the following caps, as set forth in section 9.3 of the Technical Support Document, on any soil cleanup objective included in Tables 375-6.8(a) and (b), with the exception of metals, as set forth in paragraph (3) below, developed for:

(i) unrestricted use, residential use, restricted-residential use and the protection of ecological resources, a maximum value of 100 ppm;

(ii) commercial use, a maximum value of 500 ppm; and

(iii) industrial use and the protection of groundwater a maximum value of 1000 ppm, and

(3) Apply a cap for metals at a maximum value of 10,000 ppm.

(c) Development of unrestricted use soil cleanup objectives. The unrestricted use soil cleanup objective for a compound will be the lowest of the soil cleanup values, calculated as set forth in appendix E of the Technical Support Document, for the protection of groundwater, protection of ecological resources and protection of public health.

(d) Development of restricted use soil cleanup objectives. The protection of:

(1) Groundwater soil cleanup objective will be the values calculated for the protection of groundwater as set forth in appendix E of the Technical Support Document;

(2) Ecological resources soil cleanup objectives will be the values calculated for the protection of ecological resources as set forth in appendix E of the Technical Support Document; and

(3) Public health cleanup objective will be the values calculated for the protection of public health for the identified use of the site, as set forth in appendix E of the Technical Support Document.

(e) Modification of soil cleanup objectives. The contaminant-specific soil cleanup objectives set forth at Tables 675-6.8(a) and (b)[1] may be modified by site specific data as set forth in this subdivision.

[1] Original should read "Tables 375-6.8(a) and (b)"

(1) Contaminant-specific soil cleanup objectives modified in accordance with this subdivision may be utilized by the remedial party for a site remedial program undertaken pursuant to:

(i) subpart 375-3 in Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(ii) and subparagraph 375-4.8(c)(1)(ii).

(2) For the calculation of a protection of groundwater or ecological resources contaminant -specific soil cleanup objective, the site-specific percentage of total organic carbon in the soil at the site may be substituted in the algorithms provided in appendix E of the Technical Support Document.

(3) For the calculation of a protection of public health contaminant-specific soil cleanup objective, site-specific data may be used to modify two of the five exposure pathways, as follows:

(i) for the particulate inhalation pathway six parameters rely on site-specific data; and

(ii) for the volatile inhalation pathway, four parameters rely on site-specific data.

(4) The algorithms to be used for each protection of public health pathway and details on the parameters which can be substituted are included in appendix E of the Technical Support Document.

(f) Use of soil cleanup objectives developed or modified. Once approved by the Department, contaminant-specific soil cleanup objectives developed or modified as set forth in this section may be utilized by the Department at other sites consistent with paragraphs (1) and (2) below.

(1) Contaminant-specific soil cleanup objectives developed for contaminants not included in Tables 375-6.8(a) and (b), as set forth in subdivision 375-6.9(b) above, will be used as guidance and shall be considered by the Department for inclusion in the Tables in this subpart during any subsequent reevaluation of the soil cleanup objectives, as set forth by ECL 27-1415.

(2) Contaminant-specific soil cleanup objectives modified for site specific parameters, as set forth in subdivision 375-6.9(e) above, may be utilized at sites manifesting similar parameters, if approved by the Department.

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Erin Crotty
Commissioner

Division of Water

Technical & Operational Guidance Series (TOGS) 5.1.9

In-Water and Riparian Management of Sediment and Dredged Material

November, 2004

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***** N O T I C E *****

This document has been developed to provide Department staff with guidance on how to ensure compliance with statutory and regulatory requirements, including case law interpretations, and to provide consistent treatment of similar situations. This document may also be used by the public to gain technical guidance and insight regarding how the department staff may analyze an issue and factors in their consideration of particular facts and circumstances. This guidance document is not a fixed rule under the State Administrative Procedure Act section 102(2)(a)(i). Furthermore, nothing set forth herein prevents staff from varying from this guidance as the specific facts and circumstances may dictate, provided staff's actions comply with applicable statutory and regulatory requirements. This document does not create any enforceable rights for the benefit of any party.

Date: November 29, 2004

TO: Regional Water Engineers, Division of Water Bureau Directors and Section Chiefs, Regional Habitat Managers, Regional Marine Habitat Protection Managers and Division of Fish, Wildlife and Marine Resource Bureau Directors and Section Chiefs

SUBJECT: Division of Water Technical and Operational Guidance Series (5.1.9)

In-water and Riparian Management of Sediment and Dredged Material

Originators: Frank Estabrooks, Karen Woodfield and Diane English

Purpose

To update and consolidate procedures for the in-water and riparian management of sediment and dredged material. The document outlines recommended procedures to be followed during dredging and dredged material management in riparian or in-water locations. This is a joint document developed by the Division of Water and the Division of Fish, Wildlife and Marine Resources. This document supersedes the NYSDEC Interim Guidance for Freshwater Navigational Dredging - 1994.

Discussion

This TOGS has been jointly produced by the NYSDEC Division of Water and the NYSDEC Division of Fish/Wildlife and Marine Resources (hereafter referred to as "Divisions"). The Divisions pursued the development of this TOGS in order to provide staff with guidance on the statutory and regulatory requirements for dredging activities and to promote uniformity in the certification and/or permitting of dredging projects throughout the state. This document applies to dredging and the in-water or riparian management of dredged material. For the purposes of this document the term dredging includes all in-water activities designed to move or remove sediment. Examples of such activities include but are not limited to mechanical and hydraulic dredging, mechanical plowing, trenching and jetting. Upland management of dredged material is not covered by this document. In regard to upland management, dredged material is considered a solid waste under 6 NYCRR Part 360, unless upland management/disposal is included under one of a number of specific permits as described in 6 NYCRR Part 360-1.2(a)(4)(ix). Beneficial use of dredged material as fill material, aggregate, or for other purposes may offer an alternative to in-water, riparian, or upland management of dredged material. NYSDEC Regional Solid Waste Engineers may be contacted concerning petitions for a beneficial use determination (BUD). Regulations covering BUD's in New York State appear under 6 NYCRR Part 360-1.15.

This TOGS is offered as an approach to environmental review of navigational dredging projects, dredging of channels and berths, dredging of ponds, trenching for pipelines and cables, and other incidental dredging in both marine and fresh waters of the state. This TOGS is not applicable to the review of dredging for industrial lagoons or dredging conducted for remediation or cleanup of sites managed by the Division of Environmental Remediation (DER) or Resource, Conservation, and Recovery Act (RCRA) corrective action sites. Sites managed by the DER include, but are not limited to, State Superfund sites, spills sites, environmental restoration program sites, brownfield cleanup program sites, and some RCRA corrective action sites. It should be noted that this TOGS is not intended to create any substantive or procedural rights, enforceable by any party in administrative or judicial litigation with the State of New York. While this TOGS contains numerical assessment criteria, it is not law or regulation. Discretion in applying the sediment quality parameters and the associated best management practices is expected and is defensible so long as human health and the environment are effectively protected. The Divisions also reserve the right, at anytime, to modify this TOGS subject to applicable laws, regulations and updated scientific information.

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Sandra Allen, Director
Division of Water

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I. INTRODUCTION

A. Discussion

This TOGS has been produced by the NYSDEC Division of Water and Division of Fish/Wildlife and Marine Resources (hereafter referred to as "Divisions") to provide staff with guidance on the statutory and regulatory requirements for dredging activities and to promote uniformity in the certification and/or permitting of dredging projects throughout the state. Dredging is an integral part of the maintenance of New York's harbors, channels, fairways, canals, marinas, ports, terminals, and reservoirs. For this reason, a uniform and balanced approach to dredging projects is important.

This document applies to dredging and the in-water or riparian management of dredged material. **For the purposes of this document the term dredging includes all in-water activities designed to move or remove sediment. Examples of such activities include but are not limited to mechanical and hydraulic dredging, mechanical plowing, trenching and jetting. For the purpose of this TOGS, "riparian" is defined as the 100 year flood plain plus any adjacent wetland integral to the surface water**. Dredged material destined for upland management or dredged material to be managed outside of New York State would be subject to different procedures and may require a different set of analyses and approvals. In regard to upland management within New York Sate, dredged material is considered a solid waste under 6 NYCRR Part 360, unless upland management/disposal is included under a dredging or other permits as described in 6 NYCRR Part 360-1.2(a)(4)(ix). Beneficial use of dredged material as fill material, aggregate, or for other purposes may offer an alternative to in-water, riparian, or upland management of dredged material. NYSDEC Regional Solid Waste Engineers may be contacted concerning petitions for a beneficial use determination (BUD). Regulations covering BUD's in New York State appear under 6 NYCRR Part 360-1.15.

To clarify the sampling, testing and certification and/or permitting process, this document provides an explanation of the requirements of state law that apply to dredging projects with a general overview of relevant federal requirements. This TOGS is offered as an approach to environmental review of navigational dredging projects, dredging of channels and berths, dredging of ponds, trenching for pipelines and cables, and other incidental dredging in both marine and fresh waters of the state. This TOGS is not applicable to the review of dredging for industrial lagoons or dredging conducted for remediation or cleanup of sites managed by the Division of Environmental Remediation (DER) or Resource, Conservation, and Recovery Act (RCRA) corrective action sites. Sites managed by the DER include, but are not limited to, State Superfund sites, spills sites, environmental restoration program sites, brownfield cleanup program sites, and some RCRA corrective action sites.

It should be noted, however, that this TOGS is not intended to create any substantive or procedural rights, enforceable by any party in administrative or judicial litigation with the State of New York. While this TOGS contains numerical assessment criteria, it is not law or regulation. Discretion in applying the sediment quality parameters and the associated best management practices is expected and is defensible so long as human health and the

environment are effectively protected. The Divisions also reserve the right to modify this TOGS subject to applicable laws, regulations and updated scientific information.

B. Required Approvals

There are a number of federal, state and local regulatory controls in place which apply to dredging projects. The applicability of these controls to each operation depends on the particular circumstances of each case, such as the sediment classification and the intended use or management of the material. However, the following descriptions can be used as an index of the current regulatory demands on projects which will result in either disposal or beneficial use of dredged material. Applicants are advised to contact NYSDEC or US Army Corps of Engineers (USACE) personnel for a case specific referral to applicable laws.

Some or all of the following State and Federal Permits may be required: Use and Protection of Waters Permit; Freshwater Wetlands Permit; Tidal Wetlands Permit; State Pollutant Discharge Elimination System Permit; Clean Water Act (CWA) § 401 Water Quality Certification; and CWA § 404 Permit and Rivers and Harbors Act § 10 Permits, issued by the USACE. An antidegradation review and Wild, Scenic and Recreational Rivers Program permits may also be required.

Use and Protection of Waters

Article 15 of the Environmental Conservation Law (ECL) and its implementing regulations found at 6 NYCRR Part 608 apply to most dredging projects. A Use and Protection of Waters permit is required by 6 NYCRR Part 608.2(a) whenever: there is to be a change, modification or disturbance of any protected stream; the bed or bank of a protected stream in the State will be disturbed; or sand, gravel or other material is to be removed. Part 608.5 also requires a permit for the excavation or placement of fill directly or indirectly in navigable waters. This includes marshes, estuaries, tidal marshes and wetlands that are adjacent to and contiguous at any point to any of the navigable waters of the State, and that are inundated at mean high water level or tide. Water Quality Certifications required by Section 401 of the federal Water Pollution Control Act are incorporated into the State regulations in Part 608.9.

Freshwater Wetlands Permits

Under the Freshwater Wetlands Act (ECL Article 24) and 6NYCRR Part 663, NYSDEC regulates activities in freshwater wetlands and in their regulated 100 feet wide adjacent areas. NYSDEC regulates such activities to prevent, or at least to minimize, impairment of wetland functions. Almost any activity which may adversely impact the natural values of the wetlands or their adjacent areas is regulated. Some activities requiring a permit include: dredging, construction of buildings, roadways, septic systems, bulkheads, dikes, or dams; placement of fill, excavation, or grading; modification, expansion, or extensive restoration of existing structures; drainage, except for agriculture; and application of pesticides in wetlands. In addition, a Freshwater Wetlands Permit pursuant to the Adirondack Park Agency (APA) Executive Law may be required from the APA for work on wetlands located within the Adirondack Park. A “Shoreline Clearing Variance” could also be required from the APA.

Within the Adirondack Park a permit would be required from the NYSDEC for work on State owned lands, or from the APA for work on private lands.

Tidal Wetlands Permits

Under the Tidal Wetlands Act (ECL Article 25) and 6NYCRR Part 661, NYSDEC administers a permit program regulating activities in tidal wetlands and their adjacent areas. In general, tidal wetlands consist of all the salt marshes, non-vegetated as well as vegetated flats, and shorelines subject to tides including areas now or formerly connected to tidal waters. The adjacent areas extend up to 300 feet inland from the wetland boundary (up to 150 feet inland within New York City). NYSDEC requires a permit for almost any activity which will alter wetlands or the adjacent areas.

State Pollutant Discharge Elimination System (SPDES) Permits

In certain instances a SPDES permit may be required. A discharge of a pollutant from a point source to the surface or ground waters of the state requires a SPDES permit. There is an exception from the SPDES permit requirement for "dredged or fill material discharged into navigable waters" in 6 NYCRR Part 751.3(a)(6). SPDES permits are required for discharges of dredged material effluent from point sources to groundwater, and permanent dredged material treatment facilities. Discharges that do not require a SPDES permit will be regulated under a 401 Water Quality Certificate.

Clean Water Act §401 Water Quality Certification.

Section 401 of the Federal Water Pollution Control Act requires that certain federal activities, including projects that require federal permits such as § 404 Permits and Federal Energy Regulatory Commission (FERC) hydroelectric permits, must obtain a 401 Water Quality Certification from the State. A Water Quality Certificate is a statement from the agency responsible for water quality indicating that the project will comply with State technology and water quality standards. Generally dredging projects require a Water Quality Certification from the State. The 401 Certification may contain conditions that will be enforced by the Federal Agency issuing approval (i.e., USACE).

Clean Water Act §404 Permit and Rivers and Harbors Act §10 Permit

Additional permits may be necessary from the USACE under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the federal Water Pollution Control Act. The USACE regulates the placement of fill or dredged material and the construction of certain structures in waterways and wetlands. The USACE jurisdiction has expanded beyond major waterways to include all waters of the United States. A Rivers and Harbors §10 Permit is required for any activity that may obstruct a navigable water and for the excavation or fill of navigable waters. This statute also applies to management activities such as in-place or ex situ capping, treatment, or subaqueous containment of sediments if the proposed activity will alter or modify the course, location, condition, or capacity of any navigable water of the United States.

Additionally, a CWA §404 permit is required when dredged material is discharged in U.S. waters.

Antidegradation Review

An antidegradation review may be required for Great Lakes Basin dredging projects. See NYSDEC Technical & Operational Guidance Series (TOGS) 1.3.9 for details.

Wild, Scenic and Recreational Rivers Program

The Wild Scenic and Recreational Rivers Program could potentially require permits for work on designated wild, scenic or recreational rivers. Within the Adirondack Park a permit would be required from the NYSDEC for work on State owned lands, or from the APA for work on private lands.

C. Jurisdictional Considerations

While it is generally acknowledged that certain types of dredged material may potentially exhibit 6 NYCRR Part 371 (Part 371) hazardous waste characteristics, most navigational dredging operations have not historically tested excavated sediments for hazardous waste characteristics.

On October 30, 1998, the United States Environmental Protection Agency (EPA) signed new rules for the management of contaminated media. The new rules contain a provision to clarify the relationship of the Resource Conservation and Recovery Act to dredged material. Specifically, the rules establish that "dredged material disposed of in accordance with a permit issued under section 404 of the Federal Pollution Control Act [33 U.S.C. S1344] or in accordance with a permit issued for the purpose of transporting material for ocean dumping under section 103 of the Marine, Protection, Research and Sanctuaries Act of 1972 [33 U.S.C. 1413] is not a hazardous waste" (RCRA) (40 CFR section 261.4[g]).

Other agencies that may have jurisdiction in dredging projects are the New York State Department of State and the New York State Office of General Services. The New York State Canal Corporation also has jurisdiction over dredging activities conducted on NYS owned lands under its jurisdiction.

D. Application Process

Primary responsibility for managing dredging permit applications rests with the Department's Division of Environmental Permits. Applicants must apply for necessary dredging permits on a Joint Application for Permit form and submit this form to the NYSDEC Regional Permit Administrator, in the regional office serving the project location. This form and supporting documentation will suffice as an application to the Department for a Protection of Waters Permit, 401 Water Quality Certification, freshwater wetlands, tidal wetlands. A copy of the

Joint Application will be forwarded to the USACE, by the Department. The USACE will contact the applicant for additional information to complete their review. If a SPDES permit is required, the applicant should complete an Industrial Application Form NY-2C and submit this with the Joint Application to the Regional Permit Administrator.

An Environmental Assessment form must also be completed and submitted with the joint application. The Environmental Assessment form is used to help assess whether the proposed action may have a significant adverse impact on the environment and may require the preparation of an Environmental Impact Statement. This assessment is required by the State Environmental Quality Review Act (SEQR) and State Environmental Quality Review regulations (Part 617).

Applications for dredging permits are subject to the Uniform Procedures Act (ECL Article 70, UPA) and Uniform Procedures regulations (Part 621). These regulations identify required application information and specify deadlines by which applications and supporting documentation must be reviewed by the Department. The UPA regulations also require the simultaneous submission of all required applications, encourage public participation, and seek to ensure timely and thorough reviews of all regulated actions. Division of Environmental Permits staff will advise as to all the components necessary for a complete permit application. For information on the Division of Environmental Permits' project management role, see Commissioner Cahill's March 14, 2000 Memorandum: Permit Management System.

1. Description of Application Process and Technical Review

The following provides an outline of the basic steps for sediment assessment and management in dredging projects.

STEP 1 PRE-APPLICATION MEETING

! Hold pre-application meeting(s) with the applicant to explain how the project should be described, and all application and information needs. The applicant should contact Division of Environmental Permits staff to arrange a pre-application meeting. Environmental Permits staff will involve the appropriate Department technical staff. Other agencies having jurisdiction may also be invited to attend the pre-application meeting.

! The coordination of smaller dredging projects into one large project may have benefits both in disposal options available and in the reduction of sampling costs. If small dredging projects are in close proximity to each other and can be coordinated easily by the applicants, such coordination can be beneficial to all involved parties.

STEP 2 DETERMINE SAMPLING REQUIREMENTS

A sampling plan should be submitted to the Divisions prior to sampling to ensure proper characterization of the proposed dredged material. The sampling plan should specify the type, number, and location of samples as well as laboratory analyses and analytical methods.

! Screen for Exemptions (see Chapter II, Section B.1)

! Identify Numbers and Locations of Samples (see Chapter II, Section B.2) Based on:

- o site contamination history
- o sampling history
- o dredging history
- o site resources/sensitivity

! Identify chemical analytes including grain size, TOC and analytes from Table 1 with additional case-specific analytes as necessary. If upland management of dredged material is planned, contact Division of Solid and Hazardous Materials for additional testing requirements.

STEP 3 REQUIRE LABORATORY ANALYSIS OF SAMPLES

! Follow laboratory protocols (see Table 1)

! Use New York State Department of Health (NYSDOH ELAP: Environmental Laboratory Approval Program) approved laboratory

! Report results based on identified quantitation levels (see Table 1)

STEP 4 EVALUATE RESULTS

! Determine dredged material classification for intended riparian/in-water management as Class A, B or C (see Table 2 and Chapter III, Section B.)

! Determine need for possible further sampling/analysis if high level of contamination is indicated

STEP 5 DETERMINE APPROPRIATE DREDGING/MANAGEMENT OPTIONS

! Determine dredging technology to be used based on appropriate sediment class (A, B, C), (see Table 3)

! Determine riparian/in-water management options based on sediment class (see Table 3)

STEP 6 DEVELOP PERMIT CONDITIONS FOR DREDGING AND DREDGED MATERIAL MANAGEMENT (Chapter V, Section C)

STEP 7 MONITOR OPERATIONS, AS NEEDED (see Chapter V, Section D)

2. Applicant Requirements for Description of Dredging Projects

The applicant should describe the physical, chemical and biological characteristics of proposed dredging and management sites in enough detail for the Divisions to estimate impacts and determine appropriate conditions governing conduct of the project.

a. Dredge Area.

! Physical - Show limits of excavation for areas targeted for dredging on a location map with a scale of no greater than one-inch to 100 feet (1:1200). When in-water disposal is proposed or when dredging in a sensitive habitat, provide bottom contours and profiles at no greater than one foot intervals before and after the proposed dredging. Detail the proposed method of dredging and indicate specific methods of operating equipment to minimize resuspension and migration of sediments.

Include an estimation of dredged material volume and if possible, estimate the length of time needed to complete dredging and transport. If applicable, summarize prior dredging operations that have occurred in this area and include any sediment chemistry, and total organic carbon (TOC) data available.

! Chemical - Sediment core samples should be collected to a depth of at least one foot below maximum proposed dredge depth or to bedrock, whichever is less. Log and analyze cores for sediment quality parameters, grain size, TOC and Unified Soils Classification System (USCS) classification. Homogenize and analyze each individual core down to dredging depth. Do not composite single or multiple cores if the grain size, TOC, and likelihood of contamination history indicate that individual horizons may be significantly different in sediment contaminant characteristics. Instead, sample and analyze the horizons separately or contact the Division of Water for guidance. If appropriate (see Chapter II, Section B.2.a), separately analyze a sample segment representing the top six inches of the sediment to be exposed after dredging.

The number of core samples required of each project may vary according to site-specific information. Chapter II elaborates on the proposed sampling plan approval process.

Water quality analyses and hydrology may also help establish baseline conditions.

! Biological - Describe existing habitat and characterize its use by biota, including rare, threatened or endangered species of special concern. Identify specially protected or regulated habitat.

b. Placement area (In-water and Riparian).

! Physical - Indicate location of the placement area on a plan or map having a minimum scale of 1:24,000. This plan or map should show the surrounding topography, 100 year flood-plain

elevation contour, cultural features, wildlife habitats, wetlands, and known or suspected sources of contaminants, such as point-source discharges, landfills, nearby water supply intakes or wells, primary and principal aquifers and any other site-specific features that would be useful in defining this proposed placement area. Represent the placement site on a site plan at an appropriate scale. The site plan should contain pre- and post-placement elevations of the site at intervals of no greater than one foot. The Divisions may require the plan to describe bottom sediments according to the USCS, along with their relevant parameters, such as TOC and grain size. Describe the method of transporting dredged material to the placement area and the manner of placement.

! Chemical - For proposed in-water placement, characterize existing surface sediment, chemical quality of the water-column and hydrology using the same parameters employed in evaluating the dredge area. Indicate sampling locations on plan or map.
For riparian placement onto previously dredged sediments, the intent is not to degrade the existing sites. The top two feet of the existing surface soils should be analyzed for contaminant loading to confirm that the contaminant level of the dredged material to be disposed of at the site does not exceed the contaminant level at the receiving site. Physical properties such as grain size and permeability should also be measured.

! Biological - Describe existing habitat and characterize its use by biota, including use by rare, threatened or species of special concern. Identify specially protected or regulated habitat. Describe post placement habitat conditions.

! Deed Restrictions - If Class C sediment is placed in a riparian area, and capped with Class A material, there may need to be provisions for deed restrictions, so that excavation beneath the Class A sediment cover would trigger management of the Class C sediments as a solid waste.

II. SEDIMENT QUALITY PARAMETERS AND SAMPLING REQUIREMENTS

Each dredging site and management area may have unique physical and chemical characteristics which will influence both the number of samples required to obtain a representative characterization of the sediment and the chemical analytes targeted in testing. Sediment testing is the most critical step in any dredging operation as proper or improper sediment characterization can have long lasting impacts on both the dredged area and the management site. Along with the physical, chemical and biological descriptions required in Chapter I, Section D.2., core sample collection and analysis will lead the applicant to more informed dredged material management decisions. The Divisions have selected a number of chemical analytes that may be tested for and these are identified in section A of this chapter. Section B describes the sampling and analysis requirements for sediment classification. If upland management of dredged material is a possible option, contact the Division of Solid and Hazardous Materials for additional testing requirements.

The TOGS relies on whole sediment chemistry analysis for determining the level of contamination and best management practices for the excavated dredged material. There are several reasons for relying on whole sediment chemistry analysis. Whole sediment chemistry is used in other Department guidance documents that predominantly rely on the Equilibrium Partitioning methodology. One such document is the Division of Fish, Wildlife, and Marine Resources, 1999, "Technical Guidance for Screening Contaminated Sediments". The whole sediment chemistry testing method is consistent with baseline values already measured in the Division of Water's sediment assessment and monitoring program and is used in scientific geochemical literature for soils and sediments.

The use of whole sediment chemistry in this TOGS is a consistent choice for sediment testing, and it has the added benefit of being simpler and less expensive than the extract concentrations used in the Toxicity Characteristic Leaching Procedure (TCLP) or the biotoxicity/bioaccumulation testing protocols.

The sampling required by the Divisions to determine whether to grant a dredge permit is <u>not</u> the same testing required by the USACE. It is acknowledged that for some dredging projects, or for in-water placement of dredged material at an EPA-designated site, the USACE may require applicants to conduct a suite of biological tests to support their permit application. If such test results are available, and considered sufficient to characterize the material to be dredged, and especially if open water placement is planned, the Divisions may elect to use this information (see Chapter III, Section B. 4) to make permit decisions in lieu of or in addition to whole sediment chemistry test results . When sediment contamination (Class B or C) is expected at the dredge site, the Divisions may still require whole sediment chemistry analysis in order to determine the appropriate best management practices to be implemented during the dredging or placement operations. Under USACE requirements, sampling would be required for open water placement according to the most recent version of "Evaluation of Dredged Material Proposed for Ocean Disposal Testing Manual" (USACE, Green Book) or "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual Inland Testing Manual" (USACE Gold Book). The Divisions may also require mixing zone analyses (see Chapter V, Section C) based on the biological test results.

A. Chemical Selection

A key element to this TOGS is the selection of chemicals for analysis and the evaluation of dredging and management options. The Divisions, therefore, focused on chemicals known to be both toxic and persistent in the environment for the in-water/riparian protocol. The Divisions selected these chemicals as important to sediment evaluation. The list includes all chemicals for which there are fish flesh consumption advisories in New York State:

PCB
chlordane
DDT and its metabolites
mercury
dioxin
cadmium
mirex

Table 1 contains the suggested analytical methods for detection of selected chemicals and references the detection limits of those analytical methods.

In the aquatic environment, these chemicals can bioaccumulate to elevated levels. Fish consumption is the primary exposure path for humans and wildlife. Sediment quality threshold values (discussed in Chapter III and listed in Table 2) for all of the above, except DDT, are based on toxicity to aquatic benthic life. The DDT threshold value is based on the protection of wildlife. The threshold values are all lower than those that would be derived to assure that fish tissues do not exceed human health advisories. Table 1 contains the threshold values below which the sediment is considered to exhibit no appreciable contamination. Table 2.1 in Chapter III provides more details on the derivation of the threshold values. The substantial, dual threat from these chemicals to both human and aquatic life warrants their selection as sediment quality parameters.

Other substances selected for testing include:

BTEX, the sum of benzene, toluene and xylene concentrations, was selected as a general indicator of petroleum contamination (i.e., gasoline). BTEX can be a problem for aquatic life in areas associated with land-based petroleum or petroleum-use facilities, marinas, and/or spills.

Benzene is a known human carcinogen and deserves separate analysis from BTEX. Human exposure to benzene can occur from drinking contaminated surface or groundwater. However, the Screening Value for Benzene in Table 2 is derived for protection of benthic life.

Arsenic is widely distributed in the environment and forms a variety of organic and inorganic compounds, some of which are very toxic to aquatic organisms. Some arsenic compounds are readily absorbed by intestinal tract and muscle tissue.

Lead is a persistent bioaccumulative chemical of growing concern to public health managers. Evidence of bioaccumulation in aquatic life to levels of concern for human health is currently

sparse. The paths of lead to human exposure include contaminated soils and drinking water. Lead is also toxic to benthic life.

Copper is toxic to aquatic life, but is not known to be the source of widespread or severe damage to aquatic life in New York State waters. When copper contamination and adverse effects are known or suspected, the metal should be required for sample analysis.

Dieldrin was selected as a common indicator of pesticide use. It is bioaccumulative and the primary path of exposure to humans and wildlife is through the consumption of contaminated fish. Dieldrin is also toxic to benthic life, which is the basis for the Screening Value in Table 2.

Total Polycyclic Aromatic Hydrocarbons (PAH) generally show little tendency to biomagnify in food chains, although in some cases of high contamination, elevated PAH body burdens in fish and bivalves have occurred. Sediment concentrations of Total PAHs in sediments from as low as 4 ppm and certainly higher than 35 ppm are toxic to benthic life. Several compounds of the PAH family are known human carcinogens. PAH's are found in soils, air, surface waters and plant and animal tissues as a result of natural processes such as forest fires, microbial synthesis and volcanic activities. Anthropogenic sources of PAH's cause higher concentrations along transportation corridors, industrial sites and in urban soils resulting from the long term use of fossil fuels (i.e., coal and petroleum) and petroleum-derived products (i.e., asphalt pavement). Total PAH is an indicator of possible impact from the spectrum of PAH compounds.

NOTE: Copper, dioxin, chlordane, BTEX and mirex are case specific analytes. The analysis and evaluation of these case specific analytes is recommended for those waters known or suspected to have sediment contamination caused by those chemicals. In the case where known discharges or spills of other potentially harmful chemicals have occurred, in or near a dredge site, or in the case of potential water quality limiting substances (see appendix A) these other analytes should be included along with those listed in Tables 1 and 2. In the case where a marina is to be dredged, BTEX may be a parameter of concern due to past gasoline spillage into the water and possible accumulation into the sediments. These determinations are made at the discretion of Division staff.

Table 1 - revised 9/25/06

Method Detection Limits and Suggested Analytical Methods

Parameter Sediment/Soil	EPA Method CLP\RCRA	Required Method Detection Limits (mg/kg, ppm)	No Appreciable Contamination (Threshold Values (mg/kg, ppm)
Metals			
Arsenic	Metals - EPA 6010B	3.0	<14
Cadmium	Metals - EPA 6010B	1.0	< 1.2
Copper+	Metals - EPA 6010B	5.0	< 33
Lead	Metals - EPA 6010B	2.0	< 33
Mercury *	Metals - EPA 6010B, 7470	0.2	< 0.17
PAH's and Petroleum-Related Compounds			
Benzene	EPA 8021, 8260B	0.0003	< 0.59
Total BTX+	EPA 8021, 8260B	0.0008	< 0.96
Total PAH	EPA 8270	0.33	< 4
Pesticides			
Sum of DDT+DDE+DDD *	EPA 8081A	0.0033	< 0.003
Mirex *+	EPA 8081A	0.189	< 0.0014
Chlordane +	EPA 8081A	0.0017	< 0.003
Dieldrin	EPA 8081A	0.0033	< 0.11
Chlorinated Hydrocarbons			
PCBs (sum of aroclors)	EPA 8082	0.033	< 0.1
Dioxin (Toxic Equivalency Total)+	EPA 1613B	0.000002	< 0.0000045
Physical Properties			
Grain Size	ASTM D41/D42		
Total Organic Carbon	EPA 9060A		

* Note: Threshold values lower than the Method Detection Limits are superseded by the Method Detection Limit.

+ Indicates case specific analytes.

B. Sampling and Analysis Requirements

Core samples should be collected and analyzed, at a laboratory certified by the New York State Department of Health (ELAP), to characterize the physical and chemical properties of the sediment in situ, prior to a dredging operation. Physical analysis should include grain size and TOC determinations. Chemical analysis should include appropriate chemical analytes and method detection limits from Table 1 with additional case-specific analytes as necessary. Evaluation of the analytical results of these samples will help determine the management and/or reuse options that can be considered, the types of dredging equipment that might be employed, and the environmental controls that may be necessary to reduce the potential impacts to fish and wildlife during dredging operations.

1. Sampling Exemptions

There are instances where sediment testing is not necessary and these exclusions are detailed below. If there are no recent spill incidents (within the past ten years) and there are no known present or historical contamination problems associated with the site or its environs, sampling and analysis of sediments for proposed dredging projects will generally not be required under the following circumstances:

a. The material to be dredged is at least 90% sand and gravel.

or

b. The entire project involves less than 1,500 cubic yards of dredged material.

or

c. The Divisions determine that the site has been appropriately sampled and analyzed within the last five years and that data reveals sediments with no appreciable contamination. The Division of Water's Sediment Assessment and Management Section maintains an extensive database of results of chemical analyses of sediment from locations throughout the state. Information from the database can be provided to applicants upon request.

Note: Sampling exemptions are not generally available for projects involving open water placement. Additional sampling waivers may be applicable on a case by case basis.

2. Collection of Samples to Characterize Sediment

A sampling plan should be submitted to the Divisions prior to sampling, indicating the type, number and location of samples to ensure proper characterization of the proposed dredged material.

a. Type of Sample. Sediment core samples should represent the complete depth of the material to be dredged, plus an additional one foot of material that will represent the new sediment surface. Sampling procedures are described in Appendix C. Methods of underwater investigation using free-fall gravity corers, or other equipment, and of logging cores and mapping sediments are given in Hunt (1984), ASTM (1993) and similar publications.

Each core should be broken into two segments:

! A segment homogenized over the complete dredging depth should be analyzed to determine the physical and chemical properties of the sediment to be dredged. Do not homogenize the core if the grain size, TOC or likelihood of contamination based on core lithology or known contamination history indicates that individual horizons within the core may be significantly different in sediment quality. Instead, sample and analyze the horizons separately or contact the Divisions for guidance.

!

! A segment representing the top six inches of the sediment to be exposed after dredging should be archived for possible future analysis (see Table C-3 in Appendix C for holding times and storage requirements). If chemical analysis of the dredging depth segment reveals Class B or C (Table 2) sediments, then some or all of these substrate segments may need to be analyzed to determine the risk of increased contamination exposure after dredging.

b. Number and Location of Samples. The applicant should propose how many samples will be collected, explain how this number was derived and why it is adequate to characterize the dredged material, including the detection of potential "hot spots" of highly contaminated sediments. The plan should also detail the locations of the sampling sites and state how they afford spatial representativeness while also providing coverage for areas likely to have been affected by specific contamination (i.e., a sampling bias should exist toward areas known to be affected by outfalls, tributaries, other industrial sources, historical spill areas, etc.). The number of samples should take into account project area, depth of dredging, potential heterogeneity of the sediments both horizontally and vertically and contaminant source locations. Projects that require dredging of relatively homogenous sediments will require fewer samples than those that require dredging of heterogeneous sediments. Sampling should preferably include no less than three sample locations for any given project. Examples of various methods for calculating how many samples would provide spatial representativeness in order to characterize a dredge site are presented in Appendix B.

c. Cost Reduction Strategies. In the case of small projects, small marina operations, etc., strategies are available to manage the cost of the analyses. These strategies should yield a reasonably accurate representation of the spatial and vertical stratigraphy and contaminant distribution in the area to be dredged and take into account historical and current pollutant inputs. Divisions approval should be obtained before any of the sample size reduction strategies are used. Unless otherwise exempt from the sampling requirements, a minimum of three sediment samples should be analyzed to characterize any proposed dredging project.

Cost reduction strategies may include:

i. Collect the required number of cores, then select those with the highest organic carbon levels and closest to known/potential contaminant sources for analysis. If the results of the initial analysis are valid, representative and indicate clean material, the other cores could be assumed likewise. More specifically, if the sediment with the highest silt and clay fraction reveals no appreciable contamination, then it is likely that relatively coarser textured samples would reveal similar or less contaminated results. If the results indicate contamination, however, then the other cores could be assumed similarly contaminated or they could be analyzed by the applicant.

ii. Collect the required number of cores and composite those with similar characteristics (e.g., grain size, TOC, color, etc.) for analysis. If this is done, a record of the cores that were composited, including their percentages of total organic carbon and USCS descriptions, as well as the post-compositing analytical results, should be submitted to the Divisions. Do not composite the cores if the grain size, TOC or likelihood of contamination based on core lithology or known contamination history indicates that individual horizons between the cores are appreciably different in sediment quality. Instead, sample and analyze the horizons separately or contact the Divisions for guidance.

iii. These strategies may also be used to reduce the number of substrate samples that need to be analyzed to characterize the sediment to be exposed as a result of the dredging operation. Analysis cost may also be reduced, for these samples, by limiting the analytical parameters to those found to be at Class B or C concentrations in the dredging depth segments.

d. Quality Assurance and Quality Control The goal of the sampling strategies presented in this TOGS is to provide sediment data which are accurate, representative and legally defensible. Therefore, the importance of Quality Assurance/Quality Control (QA/QC) measures in sampling sediments cannot be overlooked. Failure to use proper containers and appropriate methods of sample

collection and preservation, collect an adequate number and type of QC samples, provide strict sample identification and chain-of-custody documentation and employ correct laboratory procedures can limit data usability, or render sample results invalid.

The project-specific sampling and analysis plan for each dredging application should include a description of the project QA/QC program. The NYSDEC Analytical Services Protocol (ASP), dated June 2000, provides the in-laboratory QA/QC requirements and should be referenced and adhered to in the project QA/QC program. All data that might be subject to challenge, should be reported via ASP Category B deliverables. Otherwise, at least twenty-five percent of samples should be reported as ASP Category B deliverables. In-field QA/QC requirements should be specified in the project sampling and analysis plan. These requirements should include, but not necessarily be limited to: sample collection methods; decontamination of sampling equipment; sample container selection; sample preservation methods; number and type of QC samples (i.e. Matrix Spike/Matrix Spike Duplicate [MS/MSD], duplicates, etc.) to be collected; sample identification; and chain-of-custody procedures.

The Divisions' general guidelines for the number and type of QC samples to be collected is presented in Appendix C of this TOGS. These guidelines may be modified on a project-specific basis at the discretion of the Divisions. Also presented in Appendix C, are guidelines for the selection of sample containers and preservation methods, a sample chain-of-custody form, sampling procedures, and a glossary of selected QA/QC terminology and qualifiers.

III. EVALUATION OF RESULTS

After sediment sampling and analysis is complete, the proposed dredged material may be classified according to sediment type to allow the selection of an appropriate management option. This chapter provides the threshold values for in-water/riparian placement, in-water/riparian management options, and the methods employed for applying sampling results to the classification scheme. Chapters IV and V describe how sediment classification impacts dredging and in-water and riparian management of dredged material.

A. Sediment Quality Thresholds For In-water/Riparian Placement

The Divisions have carefully considered how sediment data should be structured and analyzed. This consideration has resulted in a classification system where sediment is placed in classes dependent upon its chemistry. The derivation of the sediment quality guidelines used in the classification system is consistent with the methodologies described in the Technical Guidance for Screening Contaminated Sediments (NYSDEC-DFWMR 1999). The Divisions have established three classes of sediment quality thresholds for dredged material proposed for in-water/riparian placement. Based on the concentration of contaminants identified during the chemical analyses, sediment to be dredged is classified as Class A, B or C (Table 2). Management options are identified in Table 3 for each class. This system differs from EPA's categorical system for in-water placement that is based on bioaccumulation and biotoxicity.

1. Class A - No Appreciable Contamination (No Toxicity to aquatic life).

If sediment chemistry is found to be at or below the chemical concentrations which define this class, dredging and in-water or riparian placement, at approved locations, can generally proceed.

2. Class B - Moderate Contamination (Chronic Toxicity to aquatic life).

Dredging and riparian placement may be conducted with several restrictions. These restrictions may be applied based upon site-specific concerns and knowledge coupled with sediment evaluation.

3. Class C - High Contamination (Acute Toxicity to aquatic life).

As defined in Table 2, Class C dredged material is expected to be acutely toxic to aquatic biota and therefore, dredging and disposal requirements may be stringent. When the contaminant levels exceed Class C, it is the responsibility of the applicant to ensure that the dredged material is not a regulated hazardous material as defined in 6NYCRR Part 371. This TOGS does not apply to dredged materials determined to be hazardous. Questions regarding hazardous waste, should be referred to the Department's Division of Environmental Remediation.

Table 2 Sediment Quality Threshold Values for Dredging, Riparian or In-water Placement

Threshold values are based on known and presumed impacts on aquatic organisms/ecosystem. Where fresh water and marine threshold values differ sufficiently, the marine value is presented in parentheses. All concentrations are in mg/kg dry weight.

Compound	Class A	Class B	Class C	Derivation Code
Metals (mg/kg)				
Arsenic	< 14 (8.2)	(8.2) 14 - 53	> 53	1
Cadmium	< 1.2	1.2 - 9.5	> 9.5	1
Copper*	< 33	33 - 207 (270)	> 207 (270)	1
Lead	< 33 (47)	33 (47) - 166 (218)	> 166 (218)	1
Mercury[+]	< 0.17	0.17 - 1.6 (1.0)	> 1.6 (1.0)	1
PAHs and Petroleum-Related Compounds (mg/kg)				
Benzene	< 0.59	0.59 - 2.16	> 2.16	2
Total BTEX*	< 0.96	0.96 - 5.9	> 5.9	2
Total PAH[1]	< 4	4 - 35 (45)	> 35 (45)	1
Pesticides (mg/kg)				
Sum of DDT+DDD+DDE[+]	< 0.003	0.003 - 0.03	> 0.03	2
Mirex*[+]	< 0.0014	0.0014 - 0.014	> 0.014	2
Chlordane*[+]	< 0.003	0.003 - 0.036	> 0.036	1
Dieldrin	< 0.11	0.11 -0. 48	> 0.48	2
Chlorinated Hydrocarbons (mg/kg)				
PCBs (sum of aroclors)[2]	< 0.1	0.1 - 1	> 1	3
2,3,7,8-TCDD*[3] (sum of toxic equivalency)	< 0.0000045	0.0000045 - 0.00005	> 0.00005	4

[+] Threshold values lower than the Method Detection Limit are superseded by the Method Detection Limit. (See Table 1)
* Indicates case-specific parameter (see Chapter II, Section A) .
[1]For Sum of PAH, see Appendix E
[2]For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration.
[3]TEQ calculation as per the NATO - 1988 method (see Appendix D)

Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

Table 2.1 Derivation Codes for Chemical Threshold Values

Derivation Code	Explanation
1	Values are the geometric mean (GM) between Long & Morgan (1990) and Persaud (1992). Class A values are the GM of ER-L[1] and Lowest Effect Level. Class C values are the GM of the ER-M[1] and Severe Effect Levels. The resulting GMs were compared to marine water ER-L and ER-M values published by Long & Morgan (1992). When compared, the lowest of the two corresponding values was selected. When there was a large difference between a freshwater (Long & Morgan (1990) or Persuad (1992) GM) and a saltwater (Long & Morgan 1992) value, the marine value was recorded in parentheses, and is applicable to marine water dredging and management only. For total PAHs, Persaud (1992) had no toxicity values so only those of Long and Morgan (1990) were used. This approach is consistent with that described in the Technical Guidance for Screening Contaminated Sediments Document (DFW/DMR 1999). The Chlordane values were developed by NYSDEC generally following the Long and Morgan method.
2	NYSDEC water quality standards were used in conjunction with the U.S. EPA equilibrium partitioning methodology (see DFW/DMR 1993, pages 5-11) to calculate sediment quality threshold values for organic compounds assuming 2% organic carbon and equating K_{ow} to K_{OC}, consistent with the reality of contaminant uptake in biological organisms (Kenaga and Goring, 1980). Class A value is for the protection of benthic life from chronic toxicity. The Class C value is for the protection of benthic life from acute toxicity. If aquatic life standards were not available from 6NYCRR Part 703.5 to generate the sediment screening criterion, a guidance value was derived in accordance with 6 NYCRR Part 706.1. For total BTEX, the A and C values are the geometric means of the A and C values for benzene, xylene, ethylbenzene, and toluene. For DDT (sum of DDT, DDD, & DDE), the A value was based upon the 6 NYCRR 703.5 standard for the protection of wildlife. Because this value (0.00022 mg/l) was below the limit of analytical detection, the analytical detection limit of 0.003 mg/l was selected as a default value. The C value was the level at which significant mortality to *daphnia magna* has been documented (Long & Morgan, 1990). This approach is consistent with that described in the Technical Guidance for Screening Contaminated Sediments Document (DFW/DMR 1999).
3	Synthesis of Consensus Based Sediment Quality Assessment Values (D.D. MacDonald, et, al., Jan 2000), Marine and Estuarine Sediment Quality Values (E.R. Long, et. al., Nov 1993), PCB soil cleanup levels in NYSDEC Division of Environmental Remediation TAGM HWR-92-4046 and of sediment quality values from NYSDEC Division of Fish, Wildlife and Marine Resources Technical Guidance for Screening Contaminated Sediments, 1998.
4	A mean of the NYSDEC Fish and Wildlife bioaccumulation number, of the USEPA's low risk to mammals, the disposal of paper sludge in pasture land and the bioaccumulation protection of fish values, was calculated and rounded down to the nearest 0.5 ppt. This value is 0.0000045 ppm or 4.5 ppt. Additionally, the soil/sediment action level for 2,3,7,8 TCDD in the RCRA hazardous waste program (TAGM DHSR 3028, 1992) is 4.5 ppt. The on-land application limit of 50 ppt is used as the contaminated level from the USEPA - Paper Industry Agreement from Environment Reporter, 29 April 1994, pages 2222-3.

[1] **Error! Main Document Only.**The ER-L values are the concentrations equivalent to the lower 10 percentile of the screened available data and indicated the low end of the range of concentrations in which effects were observed or predicted (concentrations above which adverse effects may begin). The ER-M values were the concentrations equivalent to the 50 percentile point in the screened available data (concentrations above which effects were frequently observed or predicted).

Table 3 RIPARIAN/IN-WATER Management Options

Activity	Class A	Class B	Class C
Dredging	Any means meeting generally accepted and approved practices	Closed bucket suggested or any means meeting environmental objectives	Closed bucket or other method minimizing loss of resuspended sediment ordinarily required
Riparian Placement	Any means meeting generally accepted and approved practices	Placement at riparian sites already containing more contaminated material. New riparian sites should be covered with Class A sediments to insure isolation of the dredged material. The depth of the cap will be determined on a site specific basis.	Riparian sites should be lined and capped with clay or other impermeable material and covered with Class A sediments to ensure long-term isolation of the dredged material from the environment. The depth of the cover material will be determined on a site specific basis.
In-water Placement	Any means meeting generally accepted and approved practices	In water placement discouraged. When applicable, sites should be capped with Class A sediment to insure isolation of the dredged material	In-water disposal ordinarily precluded.
Barge Overflow	Barge overflow may be allowed (site specific)	Usually, no barge overflow. May be allowed on site specific basis	No barge overflow
Post dredging Monitoring	May be required	See Chapter V	See Chapter V

NOTES:

1. Environmental Objectives for Dredging, Chapter IV, Section A applies to all classes.
2. Environmental Objectives for Dredged Material Management Placement at Riparian and/or In-water Sites, Chapter IV, Section B applies to all classes.
3. Riparian sites are adjacent to or within the 100-year flood plain of the surface waters in which dredging is proposed. These sites are typically diked with controlled outlets for retention of sediment and are typically regulated under Section 401 of the CWA. They do not constitute “on-land” placement.
4. Due to site specific circumstances, an applicant has full responsibility to justify all operations, including both those described above and any other selected alternatives.
5. Depending on conditions, hydraulic dredging to a confined disposal facility or excavation in the dry is the recommended method for PCB concentrations of greater than 10 ppm. Dredged material should be disposed of directly at final disposal sites. An applicant may justify another method of dredging and disposing of this material, as long as no net dumping of contaminated dredged material is proposed. If concentrations approach 50 ppm, Division of Environmental Remediation should be consulted.

B. Application of Sampling Results

1. Because these dredge and placement or disposal levels are based upon a limited number of screening parameters, one or more exceedances of a threshold in any level may be considered presumptive evidence that dredged material management should meet the restrictions of the more stringent level. However, judgment should be applied in interpreting the results. For example, failure of only one sample may be an analytical or sampling anomaly. Failure of two or three samples within a reasonable range of statistical, analytical variability may also not warrant special treatment. Biological testing may be used as an additional tool to evaluate the level of classification of the dredged material (See Section B.4). Consult with Division of Water and the Division of Fish, Wildlife, and Marine Resources staff in these cases before classifying material.

2. If one or more samples exceed Class C (high contamination, acute toxicity) thresholds for sediment quality, in-water disposal will likely be precluded. For riparian placement, the Division of Solid & Hazardous Materials staff and if necessary the Division of Environmental Remediation staff should be consulted to determine further site characterization needs and to assess dredging and disposal requirements (i.e., Part 373 site or other facility).

3. In the event that dredging may expose more highly contaminated sediments, as evidenced by the analysis of a sample segment representing the top six inches of the sediment to be exposed after dredging, prevent or limit exposure by one of the following options:

- dredge to a shallower depth than originally proposed;
- dredge to a greater depth until cleaner sediments are exposed; or
- dredge to a greater depth and then cap with available cleaner material.

4. Biological Testing of Dredged Material for Management Options.

Although the Divisions do not routinely require biological testing, the Army Corps of Engineers (USACE) may require applicants to conduct a suite of biological tests to support their federal dredging permit application. If such test results are available and considered sufficient to characterize the material to be dredged, and especially if open water placement is planned, the Divisions may elect to use this information in lieu of or in addition to whole sediment chemistry test results to make permit decisions for dredging and management of dredged material. When sediment contamination (Class B or C) is expected at the dredge site, the Divisions may still require whole sediment chemistry analysis in order to determine the appropriate best management practices to be implemented during dredging or placement operations.

Biological testing conducted to satisfy federal regulations and guidance usually consists of:

! 24-96 hour elutriate (suspended particulate and water) dilution series assays
! 10 day solid phase acute toxicity assays

- 28 day solid phase bioaccumulation assays.

If toxicity and bioaccumulation testing indicates a lower level of concern for acute and chronic effects than the corresponding sediment chemical results, then the Divisions, after evaluating project specifics (such as proximity of sensitive habitats and water use areas, the volume of material, the duration and seasonal window of the dredging, or the characteristics of the contaminant(s) of concern) would have the option of approving the management of the material at a lower classification level.

For more information on biological testing and the application of test results, see Appendix F.

IV. GENERAL GUIDELINES FOR DREDGING AND IN-WATER AND RIPARIAN MANAGEMENT OF DREDGED MATERIAL

This Chapter discusses management objectives for dredging and riparian and in-water placement of dredged material, design considerations for riparian placement facilities, and guidelines for monitoring activities during dredging and placement activities. These measures may help minimize any impacts incident to dredging and may ensure the long term protection of the dredged material placement area. The beneficial reuse of dredged material should be promoted when practical. It is important to keep the following objectives in mind so that aquatic habitats, wetland habitats, and riparian areas are protected.

A. General Dredging Guidelines

1. Environmental Objectives for Dredging

Dredging projects should comply with the specific provisions of all permits issued for the activity and should be planned, permitted and conducted toward achieving the following environmental objectives:

- Minimize the resuspension of silt, oil and grease and other fine particles or materials by careful equipment operation, floating booms, silt curtains or screens and other suitable means.

- Minimize the amount of material disturbed or returned to the water body. For mechanical dredging of sediments containing contaminant concentrations at levels of concern, the use of a closed, watertight bucket and the elimination of barge overflow may be required.

- Avoid damage to nearby wetlands and habitats from dredging activities.

- Avoid known historical or archaeological sites and minimize impacts if any previously unknown sites are discovered.

- Avoid dredging in particular water bodies during fish migration and spawning periods specified by the Division of Fish, Wildlife and Marine Resources for species of concern. Timing restrictions may be eased or lifted for small, closely monitored dredging projects, if the use of containment measures, such as silt curtains, adequately isolate the site during fish spawning and rearing periods.

- Avoid littoral zones and any adverse impacts to the littoral zone whenever possible.

- Avoid exposing benthic organisms to more highly contaminated underlying material.

2. Best Management Practices

Best Management Practices (BMP's) that meet the environmental objectives for dredging may include, but are not limited to, the following options. BMP's should be chosen with

consideration of site and project specific conditions and apply to all dredged material regardless of how it is to be managed.

Clamshell Dredge: When using a clamshell dredge, the amount of suspended solids dispersed during the dredging operation should be minimized by maximizing the size of the bucket used for dredging. This minimizes the number of "bites" needed to dredge a particular site. Bucket retrieval rates should be controlled to minimize turbidity. The spuds or anchors of the haul barge should be carefully placed outside the contaminated area to reduce resuspension of contaminated sediments. When off loading dredged material using a clamshell or backhoe, the bucket should not swing over open water.

Closed Clamshell: The closed clamshell bucket reduces the amount of suspended solids in the upper water column at the site of dredging. A closed clamshell bucket may be required when the sediments to be dredged contain contaminants at levels of concern as determined by the Divisions or if warranted by site specific conditions. Bucket retrieval rates should be controlled to minimize turbidity. The spuds or anchors of the haul barge should be carefully placed outside the contaminated area to reduce resuspension of contaminated sediments. When off loading dredged material using a clamshell or backhoe, the bucket should not swing over open water. The environmental bucket should have a sealing system to minimize the loss of material during transport through the water column. Excessive loss of water from the bucket should be investigated and repaired. An experienced bucket dredge operator with sufficient control over bucket depth, bucket closure and bucket hoist speed should be used.

Hydraulic Dredge: Hydraulic dredging, a vacuum-suction dredging process, is preferable when the placement site is within pumping distance of the dredge site. This type of dredge reduces the resuspension of suspended solids at the dredge site. However, large volumes of high percent water content material are created by this method and this water may require greater settling time and/or treatment prior to discharge.

Barge Overflow: No barge overflow should be allowed during transport of dredged material outside the dredged area. Barge overflow may be allowed during the dredging operation if the dredged material is determined to be Class A material. It should be avoided during the dredging operation if the dredged material is Class B or Class C (See Table 3) or if there are site specific reasons for not approving its use with Class A material.

Silt curtains: Silt curtains, can greatly reduce the long-term turbidity occurring during the dredging operation in water current flows of less than 1 foot per second (ft/sec). Silt curtains have been used to protect tidal creeks near the dredging area. Very poor silt curtain performance can be expected in flows of greater than 1 ft/sec. Controlling long term turbidity may also be accomplished using sheet pilings to cut off the disturbed area during work.

Shunting: Shunting, pumping via pipe of the free water in a barge to the bottom of the water column, may be permitted as an alternative to barge overflow as long as no disruption of in-place sediments occurs.

Tidal Periods: In certain semi-enclosed water bodies, dredging may only be allowed during the incoming tide. This practice may minimize the dispersal of contaminated sediments by allowing time for settling of suspended sediments.

Dredging Inspectors: In some cases, independent USACE certified dredging inspectors may be required to observe the dredging operation and report on compliance with permit requirements.

Coffer dam dewatering: Some dredging projects may include the construction of a coffer dam in the water column, with dewatering of the coffer dam prior to the dredging operation. Coffer dam dewatering should be conducted in a manner so as to preclude visible increases in turbidity or sheens in the waterbody. If the underlying sediments to be dredged are Class C, coffer dam dewatering effluent may need to be treated (settling, filtering, etc) prior to discharge back to the waterbody.

Flocculent addition: The proposed addition of a flocculent, during sediment dewatering operations, requires the submission of the Water Treatment Chemical (WTC) Usage Notification Requirements for SPDES Permittees form if the dewatering effluent is to be discharged to waters of the State. The permittee must demonstrate that any flocculent remaining in the effluent will not be toxic to organisms in the receiving water.

B. General Guidelines for In-Water and Riparian Management of Dredged Material

1. Environmental Objectives for Dredged Material Management at Riparian and/or In-water Sites

a. Riparian sites.

! New placement sites should not be located in wetlands or other specially protected or regulated habitats or in identified significant habitats.

! Placement within the 100 year flood-plain may be limited if the fill would cause an increase in the backwater elevation of a given flood event.

! Contaminated material should be covered with Class A sediments to a depth that ensures the long-term isolation of dredged material from the surrounding environment.

! Sites planned for use during multiple dredging seasons should be covered, with an interim cover that is equivalent to the final cover, if the period between use exceeds three years for Class B material and one year for Class C sediments. The need for an interim cover can be determined on a case-by case basis, depending on the bioaccumulative nature of the contaminants of concern. Alternatively, a dredging project that involves sediments with different levels of contamination may be dredged so that the most contaminated sediments are placed at the disposal site first and are then subsequently covered with cleaner sediments.

! Use of and maintenance of existing sites should minimize impacts to nearby wetlands. Any material re-excavated from riparian placement areas for other use should meet the sediment quality requirements for the other use.

! Placement sites should be maintained and operated to prevent the uncontrolled release of sediments beyond the boundary of the site or into surface waters.

b. Non-capped, In-water sites.

! In-water placement should be limited to dredged material that is homogeneous, consists of generally coarse grained material and shows no evidence of appreciable contamination. In water placement should only be used when practicable on-land or riparian management alternatives are not available.

! In-water placement of contaminated dredged material in any “clean” area viewed as an economic or environmental resource of New York State should be discouraged. As an example, such areas might support sand mining, commercial or sport fishing and/or be near public bathing beaches.

! In-water placement of dredged materials at EPA-designated sites will continue to be a viable option, since these sites have undergone environmental review, are authorized for such placement, and have established sediment criteria.

! The placement area should not be located in specially protected or regulated habitats or identified significant habitats.

! In-water placement activities must be approved by the Divisions and must minimize intrusion into littoral areas.

! The resuspension of fine-grained materials should be minimized for in-water placement areas by use of silt curtains, floating booms, the proper selection and careful operation of equipment and other suitable means.

! Characteristics of the dredged material should be similar to existing characteristics at the placement area to ensure that aquatic communities will reestablish themselves.

c. In-water capped sites.

These sites should be limited to moderately contaminated sediments (Class B) when no upland or riparian management sites are available.

In addition to the considerations in item b above, the following apply.

! Site-specific biological surveys, toxicity and bioaccumulation testing may be required for approval and for post-placement monitoring. These studies should

support the contention that biota exposed to the site after placement will not contain appreciably more body burdens of contaminants and will not experience acute or chronic toxicity.

! Existing depressions and old excavations (e.g., borrow pits) should be considered before any new excavations are created. Capping with Class A sediments and leveling to surrounding bottom contours will likely be required.

! Cap material should be deposited in a thickness that will provide long-term isolation of the dredged material from the overlying water. Capping material should have the same characteristics as the surrounding bottom sediments to prevent differential scouring and encourage re-establishment of benthic communities.

! Placement area should not be proposed for future dredging or mining; it must be recorded on USGS, NOAA or other appropriate maps, using Universal Transverse Mercator (UTM) or New York Transverse Mercator (NYTM) coordinates.

2. Design Consideration for Riparian Confined Disposal Facilities

For the purpose of this TOGS, “riparian” is defined as the 100 year flood plain plus any adjacent wetland integral to the surface water. Riparian confined disposal facilities are by this definition any facility located within the 100 year flood plain or adjacent wetland. Other names for a confined disposal facility may be upland disposal site or containment site. These sites are typically diked with controlled outlets for retention of sediment and are typically regulated under Section 401 of the CWA. They do not constitute “on-land” placement.

1. Riparian disposal facilities should be located, where possible, on soils with low permeability (i.e., Soil Conservation Service soil groups C and D).

2. The disposal facility should retain dredge water for the time required to meet discharge conditions (see Chapter V, Section A). The volume needed to provide this retention period should be in addition to the volume needed for solids storage. Disposal facilities designed to receive solids from more than one dredging cycle should use any excess volume to increase the retention period to the maximum practicable extent.

3. Inlet and outlet openings should not be placed directly in-line with each other unless baffles are in place to provide adequate settling time.

4. A minimum water depth of three feet should be provided for retention, using a controlled-outlet weir, in a disposal facility served by a hydraulic dredge. The weir overflow rate should be controlled in order to achieve an acceptable effluent concentration for suspended solids.

5. The length-to-width ratio of the disposal facility should be greater than two to one where the length is the distance between the inlet and the outlet.

6. A baffle could be constructed as part of the outfall structure to prevent the release of floating debris and oils.

7. The outlet should convey the discharge in an erosion-free manner, preferably to an existing stable channel.

NOTE: The prime objective of these design considerations is to enable reasonable capture of fine grain sediments, which contain most of the contaminants. Any number of engineered methods can increase fine grain capture. Design of confined disposal facilities for Class C sediments are site-specific and should ensure optimal fines (see glossary) capture to retain pollutants.

V. PERMIT CONDITIONS FOR DREDGING AND DREDGED MATERIAL MANAGEMENT

The dredging permit or Water Quality Certification may contain special conditions which will vary depending upon dredged material classification, where discharges are directed, or where sediment generated from dredging operations is placed.

When discharges associated with dredging operations are directed outside of the dredging area, the receiving water may experience loadings of new pollutants. These loadings should be reviewed in accordance with Division of Water's TOGS 1.2.1 and TOGS 1.3.1. These TOGS should be followed for calculating the total maximum daily loading (TMDL) and to determine if any water quality based effluent limits are necessary. The dredging permit or 401 Certification would then be conditioned with any applicable water quality based limits, technology limits, requirements for best management practices, mixing zone limits, and monitoring requirements.

When discharges associated with dredging operations are directed back into the dredge area, and if no new pollutants are added to the dredged material, the discharge may not need to be reviewed to determine an allowable TMDL. The dredging permit or 401 Certification could then be conditioned with applicable technology limits or narrative water quality standards, BMPs, mixing zone limits, and monitoring requirements.

A. Water Quality Based Limits and Technology Limits

A mixing zone can be assigned at the site of dredging, at the site of in-water placement of dredged material and at the effluent discharge from on-water processing, on-land processing, and confined disposal facilities (see Section C, following). The narrative limits presented in Table 4 apply at the edge of any defined mixing zone and should be included as conditions in the 401 Certification or dredging permit. For water quality limiting substances (Appendix A) and parameters measured at levels higher than Class A threshold values in the dredged material, concentrations at the edge of the mixing zone should not exceed water quality standards or background conditions plus an allowance for analytic variability.

Table 4 Section 703.2 Narrative Water Quality Standards

Parameter	Classes	Standard
Turbidity	AA, A, B, C, D, SA SB, SC, I, SD	No increase that will cause a substantial visible contrast to natural conditions
Suspended, Colloidal, and Settleable Solids	AA, A, B, C, D, SA SB, SC, I, SD, A-special	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages

For effluent from on-water or on-land processing and confined disposal facilities, an alternative to meeting water quality standards at the edge of an established mixing zone would be setting effluent limits at the point of discharge (e.g. at the weir). The following options would be available:

The applicant can suggest and justify a maximum limit for TSS and/or turbidity at the point of discharge (e.g. at the weir). This justification should demonstrate that the proposed limit will not cause detrimental effects to the environment or to human health. This case specific-number should be developed with attention to existing background concentrations of TSS in the receiving water, to any and all localized water quality limiting substances or chemicals of concern, and to the proximity of any critical water use areas or sensitive habitats. The Divisions will evaluate the justification of the proposed limit with the goal of ensuring environmental protection and that no exceedance of water quality standards are likely to occur.

-or-

The following default technology limits at the point of discharge (e.g. at the weir) may be used as dredging permit or 401 Certification conditions:

- total suspended solids - 200 ppm;
- settleable solids - monitor; (no limit)
- chlorides - none greater than 110 percent of the background concentration; and
- for water quality limiting substances and tested parameters at levels higher than Class A level - limits determined by procedures outlined in TOGS 1.2.1 and TOGS 1.3.1 for developing TMDL's.

B. Best Management Practices.

Best management practices (BMPs) during dredging and dredged material management operations should be included as conditions in the 401 Certification or dredging permit if appropriate. These practices should protect sensitive resources in the vicinity of dredging or dredged material management activities and may include:

- Operational controls, during dredging, such as the use of a closed bucket, a controlled bucket speed or cycle speed, and no barge overflow. These measures can all be instrumental in reducing the amount of solids resuspended and therefore the extent of the area impacted by dredging.
- Silt curtains to protect sensitive habitats from resuspended solids.
- Environmental windows which restrict dredging or placement during fish migration and spawning periods.

Lists of possible BMPs are included in Chapter IV, Sections A and B.

C. Mixing Zones

A mixing zone is an area in a water body, defined by DEC, within which the Division of Water will accept temporary exceedances of water quality standards resulting from short-term

disruptions to the water body caused by dredging or the management of dredged material. A mixing zone can be assigned at the site of dredging, at the site of in-water placement of dredged material, and at the effluent discharge from on-water processing, on-land processing, and confined disposal facilities. (See Section A, preceding, for water quality limits that apply at the edge of any defined mixing zone).

In the case of contaminated sediment resuspended during dredging or dredged material management, disruptions to beneficial uses of the water-body must be minimized. The size and shape of mixing zones should be limited to ensure that they do not impair the integrity of the water body as a whole and that there is no lethality to organisms passing through or enveloped by the mixing zone (EPA Water Quality Standards Handbook - 2nd Edition - August 94). In addition, mixing zones should be established to provide a continuous zone of passage and to prevent any impairment to critical resource areas (EPA 94). Shallow water shorelines of rivers, lakes and the coast line, wetlands and biologically active zones should receive the greatest protection when establishing the limits of mixing zones (EPA 76).

To ensure protection of aquatic life when defining the allowable extent of a mixing zone, the following should be considered:

- Along shorelines, acute toxicity thresholds for suspended sediments should not be exceeded beyond a distance of 500 feet along the shore.
- In rivers and river-like sections of estuaries, acute toxicity thresholds for suspended sediments should not be exceeded beyond a distance of one third the width of the waterway or a total width of 500 feet, whichever is less.
- In open water areas of estuaries and lakes, acute toxicity thresholds for suspended sediments should not be exceeded beyond a distance which corresponds to 10% of the cross-sectional area of the waterway or a total width of 1500 feet, whichever is less.
- Wetlands, tidal creeks and other critical resources (e.g., water use areas or areas with abundant early life stages of fish or shellfish) must be protected from levels of suspended sediments that cause chronic toxicity. Permit review staff should delineate the size and shape of the chronic toxicity mixing zone to protect these resources.

For dredged material that has undergone suspended phase toxicity testing:

- The threshold of acute toxicity is estimated to be the suspended sediment (SS) concentration associated with 0.1 x the LC50.
- The threshold of chronic toxicity is estimated to be the suspended sediment (SS) concentration associated with 0.05 x the LC50.

For dredged material that has not undergone suspended phase toxicity testing:

- The threshold of acute toxicity is considered to be any SS levels 100 ppm above ambient conditions.
- The threshold of chronic toxicity is considered to be any SS levels 50 ppm above ambient conditions.

The Divisions may assign a default mixing zone of 500 feet (unless there is a critical water use area or sensitive habitat located closer than 500 feet) or require the applicant to provide a mixing zone analysis when whole sediment chemistry test results identify the presence of water quality limiting substances (Appendix A) or analytes at concentrations higher than the Class A threshold values or when sediment toxicity test results warrant. The analysis shall characterize the extent of potentially toxic water quality conditions that may result from remobilization of contaminants during dredging or management activities. This determination shall be made by the Divisions on a case-by-case basis and shall include consideration of the following:

- The nature of sediment contamination
- Proximity of sensitive habitats or water use areas (beaches, water intakes, etc.)
- Proximity of sensitive life stages of important biological resources.

Information such as sediment chemical and physical characteristics may be used to assess the potential impacts at the dredging or management site. Qualitative assessments which compare the proposed project to similar projects, for which field monitoring results are available, may also be considered.

1. Mathematical Models.

In some cases, mathematical models can be used to calculate contaminant or suspended solids concentrations at the boundaries of a defined mixing zone. If, based on characterization of sediments or whole sediment chemistry or toxicity tests, it is determined that the sediments are or have the potential to be toxic to aquatic life, then the Divisions may require the applicant to study the proposed dredge activity with the use of an appropriate model. The model should be used to determine whether predicted water quality conditions at the edge of the allowable mixing zone will comply with conditions in the 401 Certification or dredging permit. The applicant may choose to use an existing model or may have a model developed for the particular location.

Most of the existing sediment dispersion models are designed for the specific situations of open water disposal in the ocean, barge overflow, or return water from an upland disposal facility. These models are complex and have limits on their applicability. USACE Automated Dredging and Disposal Alternatives Management System (ADDAMS) models are available on the USACE web page and can be downloaded onto a personal computer.

The following guidelines apply to the use of mathematical models:

- If one of the existing mixing zone models is used (e.g. ADDAMS, CORMIX), then all input parameters and model runs should be provided to the Division of Water for review. If a new mixing zone model is developed for a particular site, the model and all documentation (including input parameters, model runs and analysis) should be provided to the Division of Water for review prior to acceptance of the predicted results.

! Some available models will predict concentrations of chemicals at the edge of the defined mixing zone. These predicted concentrations should be compared to the water quality standards (6NYCRR Parts 700-706) to ensure standards are not exceeded outside this mixing zone.

! Some available models will predict acute or chronic toxicity at the edge of the defined mixing zone. The predicted results should be compared to existing standards for toxicity.

! The predicted conditions at the boundary of the mixing zone should be evaluated based on proximity to sensitive habitats or water use areas.

! The model should be verified as appropriate for use in the particular flow situation. Some mathematical calculations for mixing can be used for steady state or non-complex flow conditions. However, tidally influenced rivers and estuaries are, by definition, complex flow conditions.

! The results of the model should be reproducible. A model cannot be used to predict conditions at the boundary of a mixing zone until it has been adequately calibrated.

! Model predictions should be verified by real-time sampling.

D. Monitoring Requirements.

A permit or certification for dredging and dredged material management may contain a number of performance requirements. If water quality monitoring is required to ensure compliance with these requirements, then the applicant, in consultation with the Divisions, should propose appropriate monitoring locations (including background sample location), action levels, and contingency requirements (i.e. corrective actions to be taken if monitoring reveals exceedances of water quality limits) for dredging and management operations, with final approval by the Divisions. The frequency and location of sample collection and the scheduled reporting of analytical results will be included in the permit and will be decided on a case-by-case basis. Monitoring may be biased toward a more intense monitoring effort during the early phases of a project. After consistent, satisfactory performance has been demonstrated, the Divisions would have the option of decreasing monitoring frequency. Any required field measurements or observations, including turbidity, should be reported to the Divisions within 24 hours. Sample analysis shall be undertaken at an environmental laboratory approved by the New York State Department of Health (ELAP). All laboratory results of analyses shall be transmitted to the Divisions electronically or by fax or overnight mail within ten working days of sample collection and immediately followed by a mailed copy. When the sediments to be dredged are highly contaminated, the permit may be conditioned to require a shorter turn around time for the transmission of required water column and/or effluent analysis results. This turn-around time shall be decided on a case-by-case basis. The permittee should identify any exceedances of the limit for suspended solids or of any other required monitoring parameter. The permittee should also include a description of the exceedance, its cause, and identify the corrective actions that were taken at the time of the exceedance. Typical monitoring requirements are as follows:

1. Total Suspended Solids

Total suspended solids concentrations may be measured directly through laboratory analysis, or a correlation may be derived for suspended solids and NTU. NTU may be measured in the field using one of a variety of available meters or sensors. An appropriate number of samples must be collected to make a statistical correlation between these two parameters.

- For dredged material that has undergone suspended phase toxicity testing, applicants should be required to measure the TSS and turbidity (NTU) of the full strength suspended phase and all dilutions tested. These measurements can be used to determine the turbidity in NTU associated with the acute or chronic toxicity levels established for the limits of any mixing zones. Turbidity in NTU may then be monitored in the field during any dredging or management operations.

- For dredged material that has not undergone suspended phase toxicity testing, applicants may be expected to collect a suspended phase sample of the dredged material, measure the TSS and turbidity, and determine if there is a correlation between the two measurements following the method in Thackston and Palermo "Improved Methods for Correlating Turbidity and Suspended Solids for Dredging and Disposal Monitoring" -1998. In accordance with this method, the applicant may be expected to provide the turbidity in NTU that is associated with TSS levels of 50 and 100 ppm above background.

2. Dredging Area

- The dredging area may be monitored for water quality parameters of concern (e.g., water quality limiting substances (see Appendix A) or substances identified at concentrations greater than Class A threshold values), for total suspended solids (TSS) at locations approved by the Divisions, or to ensure compliance with mixing zone limits. If a mixing zone limit was set using a mathematical model, TSS or turbidity monitoring requirements may be waived after real-time sampling verifies model predictions.

- The dredging area should be routinely inspected for compliance with general and special permit conditions for protection and restoration of habitat.

- The post-dredging sediment surface may be sampled and analyzed for sediment quality parameters and other contaminants of concern to assure that their concentrations do not exceed pre-dredging levels. This may be required if initial sampling and analysis of the sample segment representing the top six inches of the sediment to be exposed after dredging (see Chapter II, Section B.2.a) indicates an increased risk of contaminant exposure. See Application of Sampling Results (Chapter III, Section B.3) for options to prevent or limit exposure.

3. In-water/Riparian Placement Area

- In-water placement should be monitored for total suspended solids (TSS), settleable solids and other water quality parameters of concern (e.g., water quality

limiting substances (see Appendix A) or substances identified at concentrations greater than Class A threshold values) at locations approved by the Divisions.

- For any capped in-water placement area, physical inspections that are supplemented, if necessary, by bathymetric surveys should be conducted periodically and after major storm events to detect loss of cap integrity.

- For riparian diked sites or confined disposal facilities, overflow should be routinely monitored at the point of discharge (e.g. at the weir) for turbidity, total suspended solids, settleable solids and other water quality parameters of concern, to assess effectiveness of retention time for prevention of sediment and associated contaminant transport back into surface waters.

- For riparian diked sites or confined disposal facilities, the effluent plume should be visually monitored daily with periodic verification of total suspended solids concentrations. If there is a visible plume outside the mixing zone, the permittee should take action to rectify the situation. If there are water quality limiting substances in the dredged sediment or levels in the sediment at higher concentrations than Class A threshold values, the permittee may be required to monitor for these parameters at the edge of the mixing zone at the frequency deemed appropriate by the Divisions. Samples should be collected until there is no longer a discharge of effluent from the site or until the site has been modified to prevent further discharge to the waterway. The analytical laboratory quantitation levels for monitored parameters must be low enough to allow a meaningful evaluation of the concentration of the analytes.

E. Violations

Exceedance of state water quality standards may subject the permittee to a monetary fine, corrective or mitigation action, or other enforcement action by the Department.

Permits or certifications containing conditions with emission, discharge or other monitoring limits (i.e., for turbidity) should state that exceedances of such limits require that corrective measures be implemented immediately and a report e-mailed, faxed or overnight mailed to the appropriate Department personnel within 24 hours. For subsequent exceedances, the Certificate should require the permittee to immediately stop the activity causing the exceedances, and e-mail, fax or overnight mail notification to appropriate Department personnel within 24 hours. Such notification should contain a plan for corrective measures.

APPENDICES

APPENDIX A POTENTIAL WATER QUALITY LIMITING SUBSTANCES

Potential Water Quality Limiting Substances are substances that cause Water Quality Limiting Segments for different water bodies throughout the State. The definition of Water Quality Limiting Segments is as follows: "A designated portion of a water body where water quality does not meet applicable standards, or is not expected to meet applicable standards, even after the application of technology based treatment requirements by industry and secondary treatment by municipalities." This definition can be found in TOGS 1.3.1 - Total Maximum Daily Loads and Water Quality Based Effluent Limits.

Potential Water Quality Limiting Substances as of July 2001

For the Upper Hudson, Mohawk and Lower Hudson Basins, the following are potential or actual water quality limiting substances: mercury, copper, cyanide, iron, lead and PCB

For the St. Lawrence River PCB's and PAH's are water quality limiting substances.

For the Grass River cadmium, copper, cyanide, fluoride, iron, lead, sulfide, surfactants, zinc and phenols are water quality limiting substances.

For the New York Harbor mercury is water quality limiting and there is a fish advisory for PCB's. Other chemicals of concern are dioxin/furan's, PAH's and chlordane.

For the Genesee River Basin phenolics, chlorinated phenolics, cobalt, cyanide, hydroquinone, lead, 1,1,1-trichloroethane, dichlorobenzene, cadmium, tetrachloroethylene and copper are water quality limiting substances.

For the Lake Ontario Basin 1,1-dichloroethylene, 1,2-dichloropropane, dimethylaniline, ethylene glycol, acrylonitrile, bis-(2ethylhexyl) ether, 2,4-dichlorophenol and 2,6-dinitrotoluene are water quality limiting substances.

For the Allegheny River Basin copper, phenol and nickel are water quality limiting substances.

For the Lake Erie-Niagara River basin chrysene, benz(a)anthracene, hexachlorocyclohexane, PCB's, endosulfan, heptachlor, DDT, hexachlorobenzene and phenolics are water quality limiting substances.

For the Susquehanna River Basin - copper, cyanide, and iron are water quality limiting substances. In addition:

- Cadmium, lead, selenium and phenols are water quality-limiting downstream of Cortland.
- Cadmium is also water quality-limiting downstream of the Amphenol Corp. discharge at Sidney.
- Mercury is water quality-limiting downstream of the Binghamton-Johnson City STP.
-

For the Chemung River Basin - antimony, cadmium, copper, cyanide, lead, iron, and thallium are water quality limiting substances. In addition:

- Nickel, silver, zinc and fluoride are water quality-limiting downstream of the Toshiba, Westinghouse, Cutler-Hammer complex.
- Mercury, nickel, silver and zinc are water quality-limiting downstream of the Facet Enterprises hazardous waste remediation site on Mays Creek.

For the Seneca-Oneida-Oswego River basins cyanide, mercury, iron, aldrin, PCB's, dichlorobenzenes, and phenols are water quality limiting substances. In addition:

- Cadmium is water quality-limiting in the Onondaga Lake sub-basin while lead and trichloroethylene are water quality-limiting in the Ley Creek sub-sub-basin.
- Lead is water quality-limiting in the Owasco Lake sub-basin and in the Skaneateles Creek sub-basin.

APPENDIX B VARIOUS METHODS FOR CALCULATING HOW MANY SAMPLES SHOULD BE COLLECTED TO CHARACTERIZE A DREDGE SITE

Balduck's Method

The method of gridded sampling proposed by Balduck, 1992 (in Keillor 1993) may be used for dredge site characterization with certain modifications based on site size, dredge history, environmental flags (e.g., fish advisory), and the presence or absence of potential pollutants in the drainage basin or local environment. The Balduck equation considers the area (not volume) to be dredged and is used only to determine the number of sediment cores to be collected to provide spatially representative sampling of the dredge site. Core sample depth and segmentation guidelines are described in Chapter II, Section B.2.

Balduck's equation, modified for English units, is:

$$N=(Df)(30)((W)(L)(\frac{1}{1.2x10^6}))^{0.33}$$

where

N = the total number of coring (sampling) stations;

$\frac{1}{1.2X10^6}$ = factor to convert square yards into square kilometers;

W = the width (in yards) of a single dredge area or the widest dredge area where there are multiple areas to be dredged;

L = the length (in yards) of a single dredge area or the sum of the lengths of the parts of a combined dredge area;

Df = a dredge factor consisting of a multiplier (unitless) from 1 to 3 based on the site's dredging, environmental or pollutant history and other case-specific factors discussed below.

Table B-1: Balduck Method for Selection of Sample Size
Number of Samples for Analysis per Area (sq. yds.) to be Dredged

	Balduck Method		
Dredging Area (sq. yds.)	Number of Samples	Number of Samples	Number of Samples
	Df = 1	DF = 2	Df = 3
5,000 - 10,000	5 - 6	10 - 12	15 - 18
10,000 - 20,000	6 - 7	12 - 14	18 - 21
20,000 - 30,000	8 - 9	16 - 18	24 - 27
30,000 - 50,000	9 - 10	18 - 20	27 - 30
50,000 - 65,000	11	22	33
65,000 - 85,000	12	24	36
85,000 - 100,000	13	26	39
100,000 - 130,000	14	28	42
130,000 - 160,000	15	30	45
160,000 - 200,000	16	32	48
200,000 - 230,000	17	34	51
230,000 - 280,000	18	36	54
280,000 - 330,000	19	38	57
330,000 - 380,000	20	40	60
380,000 - 440,000	21	42	63
440,000 - 500,000	22	44	66
500,000 - 580,000	23	46	69
580,000 - 650,000	24	48	72
650,000 - 750,000	25	50	75
750,000 - 830,000	26	52	78
830,000 - 930,000	27	54	81
930,000 - 1,030,000	28	56	84

Df equals 1 for sites:

- with no previous sediment data; and
- no suspected likelihood of appreciable contamination.

Df equals 2 for sites:

- with no previous sediment data; but
- where there is a likelihood of contamination based on history of surrounding land uses (e.g., heavy industry), spills, observed environmental stresses; and dredging has occurred within the last five years; or
- near particularly sensitive features, e.g., water supply intakes, unique habitats.

Df equals 3 for sites:

- with documented contamination from past sediment data; or
- in areas of established fish advisories or spills or site-specific contamination of concern (e.g., copper, mirex, dioxin, PCB's) in the drainage basin; or
- where there is a likelihood of contamination and dredging has not occurred in the last five years.

NOTE:

Df of 0.5 where:

- previous data show no contamination.
- there is no likelihood of contamination.

SORENSEN

A Dutch formula for estimating sample density for conventional maintenance dredging was proposed by Sorensen (1984). The formula is as follows:

$$N = 3 + \left[\frac{(A^{0.5} * d^{0.33})}{50} \right]$$

where

N = number of cores
A = area (sq. Meters)
d = depth (meters)

ENVIRONMENT CANADA

An Environment Canada method for selecting the number of samples was presented by Macknight (1991). These guidelines call for calculating the dimensions of a sampling block (grid rectangle), using1000 cubic meters as a sampling block volume. For larger areas, this method calls for more samples than the other two methods. For small dredge areas, fewer samples would be suggested. The Canadian method calls for a sample in the center of each 1000 cubic meter block and is less random that the other two methods.

For more information on this method see: Mudrock A + S.D. MacKnight, 1991. Handbook of Techniques for Aquatic Sediments Sampling. pp.210. CRC Press, Boca Raton, FL.

APPENDIX C SEDIMENT SAMPLING

Table C-1 QC SAMPLES FOR SEDIMENTS			
Sample Type	**Purpose**	**Collection**	**Documentation**
Duplicate	Check laboratory and field procedures	1 sample per week or 10% of all field samples, whichever is greater	Assign two separate sample numbers, submit blind to the lab
Equipment (Rinseate) Blank	Check field decontamination procedures	Collect when sampling equipment is decontaminated and reused in the field.	Assign separate sample number
Matrix Spike and Matrix Spike Duplicate (MS/MSD)*	Required by laboratory protocols.	1 sample per twenty sediment samples	Assign both samples the same sample number. Indicate MS/MSD on chain-of-custody form.

*This is not necessary with PCB congener method or high resolution pesticide method or dioxin/furan analyses.

Table C-2 SAMPLE CONTAINERS AND VOLUMES FOR SEDIMENT SAMPLES		
Type of Analysis	**Type and Size of Container**	**Number of Containers and Sample Volume (per sample)**
Purgeable (Volatile) Organics	2-oz. glass jar with Teflon lined cap	Two; fill completely
Extractable Organics, Dioxin/Furan Pesticides/PCBs	8-oz. amber glass jar with Teflon-lined cap	One; fill completely
Metals	8-oz. glass jar with Teflon-lined cap	One; fill half full

Table C-3 SAMPLE PRESERVATION AND HOLDING TIMES FOR SEDIMENT SAMPLES		
Parameter	**Preservative**	**Maximum Holding Time[1]**
Volatiles	Cool to 4 C	7 days
PCBs/Pesticides	Cool to 4 C	Extract within 5 days, analyze within 40 days
Extractable organics	Cool to 4 C	Extract within 5 days, analyze within 40 days
Metals	Cool to 4 C	6 months
Mercury	Cool to 4 C	26 days
Dioxin/Furan	Cool to 4 C	Extract within 30 days, analyze within 1 year

[1] Holding times are based on verified time of sample receipt (VTSR). Source NYSDEC Analytical Services Protocol.

CHAIN OF CUSTODY RECORD

WORK ORDER #:
CUSTODY No:
PROJECT:
SAMPLED BY:
LOCATION:

SAMPLE NUMBER	DATE	TIME	SAMPLE LOCATION	MATRIX	COMPOSITE OR GRAB	FIELD MEASUREMENT	No. OF CONTAINERS	ANALYSIS REQUIRED							REMARKS (PRESERVATION, ETC.)

RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	RELINQUISHED by: (Signature)	DATE: TIME:	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	RELINQUISHED by: (Signature)	DATE: TIME:	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	SHIPPED / DELIVERED:	DATE:	TIME:
RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	REMARKS:		
RELINQUISHED by: (Signature)	DATE: TIME:	TIME:	RECEIVED FOR LABORATORY BY: (Signature)			

Sampling Procedures

Core Samples

Sediment cores should be collected using a vibra-coring apparatus, or other appropriate coring device. Selected equipment is to be used in accordance with the manufacturer's instructions. Clean, decontaminated core tube liners must be used. The bottom of the coring tube liner should be immediately capped and taped upon removal of the coring apparatus from the water. The core tube liner should then be removed from the coring apparatus and its top immediately capped and taped.

The core tube liner and boat deck should then be rinsed with ambient water to reduce the risk of contaminated sediments becoming airborne as they dry.

A visual inspection of the sediment cores should then be performed. Individual horizons or strata within each core should be measured, along with the overall core length. These measurements and all significant features should be documented in a field notebook. The field notebook should also document the date, time, and location of each sample collected. Using a permanent marker, the date, time, and sample location should also be recorded on the sediment core tube liner. High resolution photographs of the cores may be taken.

The sediment core (or segment if appropriate) should be emptied into a clean tub and mixed with a clean spatula made of appropriate material. Generally sediment to be analyzed for trace metals should not come into contact with metals and sediment to be analyzed for organic compounds should not come into contact with plastics. When the sediment appears mixed to a uniform color and consistency, a clean scoop should be used to place the material into acid washed wide mouth glass jars with Teflon® lined screw lids. After a jar is capped and labeled, it should be immediately placed on ice in a cooler.

All sample containers should be labeled using a permanent marker to indicate the date, time, and sampling location. This information should then be recorded in a field log book and on a chain of custody form which will follow the samples. Sediment material not placed in sample bottles should be returned to the location from which it was collected. All sample bottles should be placed in coolers with ice and delivered to the laboratory via overnight delivery service.

Sediment Data Qualifiers

Qualifiers for Organics Analyses

Value	If the result is a value greater than or equal to the quantification limit, report the value.
U	Indicates compound was analyzed for, but not detected.
J	Indicates an estimated value.
N	Indicates presumptive evidence of a compound.
P	This flag is used for a pesticide/Aroclor target analyte where there is greater than 25% difference for detected concentrations between the two GC columns (see Form X). The lower of the two values is reported on Form I and flagged with a "P".
C	This flag applies to pesticide results where the identification has been confirmed by GC/MS.
B	This flag is used when the analyte is found both in the associated blank and in the sample.
E	This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.
D	This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is re-analyzed at a higher dilution factor, as in the "E" flag above, the "DL" suffix is appended to the sample number on the Form I for the diluted sample, and all concentration values reported on that Form I are flagged with the "D" flag. This flag alerts data users that any discrepancies between the concentrations reported may be due to dilution of the sample or extract.

NOTE: These qualifiers do not apply to the PCB congener method 1668, but are applicable to the recommended PCB method 8082.

Qualifiers for Metals Analyses

B	The reported value is less than the Contract Required Detection Limit but greater than the Instrument Detection Limit.
U	The Analyte was analyzed for but not detected, i.e., less than the Instrument Detection Limit.
E	The reported value is estimated because of the presence of an interference.

Glossary of Selected QA/QC Terms
(source: NYSDEC ASP, 10/95)

Analytical Services Protocol (ASP) - the collection of analytical methods and corresponding reporting and quality control procedures that has been adopted by the Division of Water.

Contract Required Quantitation Limit (CRQL) - minimum level of quantitation acceptable under the ASP.

Equipment Rinseate - a sample of analyte-free media which has been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment.

Field Blank - any sample submitted to the laboratory identified as a blank prepared in the field. The purpose of the field blank is to document whether or not there was contamination introduced in the collection of the sample.

Field Duplicates - an additional sample taken from the same homogenized sample and sent to the analytical laboratory for identical analysis.

Holding Time - the elapsed time, expressed in days, from the date of receipt of the sample by the laboratory until the date of its preparation (digestion, distillation or extraction) and/or analysis.

Matrix - the predominant material, component, or substrate (e.g., sediment) of which the sample to be analyzed is composed. Matrix is not synonymous with phase (liquid or solid).

Matrix Spike (MS) - aliquot of a sample fortified (spiked) with known quantities of specific compounds (target analytes) and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Matrix Spike Duplicate (MSD) - a second aliquot of the same matrix as the MS that is spiked with identical concentrations of target analytes as the MS, in order to document the precision and bias of the method in a given sample matrix.

Method Detection Limit (MDL) - the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

Minimum Quantitation Limit - the minimum level that an analyte can be quantitated within a specified precision.

Percent Moisture - an approximation of the amount of water in a sediment sample made by drying an aliquot of the sample at 105 °C. The percent moisture determined in this manner

also includes contributions from all compounds that may volatilize at or below 105 °C, including water. Percent moisture may be determined from decanted samples and from samples that are not decanted.

Practical Quantitation Limit (PQL) - is the lowest level that can be measured within specified limits of precision during routine laboratory operations on most effluent matrices.

Project - single or multiple data collection activities that are related through the same planning sequence.

Replicate - independent samples which are collected as close as possible to the sample point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently at the same laboratory. These replicates are used to characterize sediment heterogeneity.

Semivolatile Compounds - compounds amenable to analysis by extraction of the sample with an organic solvent. Used synonymously with Base/Neutral/Acid (BNA) compounds.

Tentatively Identified Compounds (TICs) - compounds detected in samples that are not target compounds, internal standards or surrogate standards. Up to 30 peaks (those greater than 10% of peak areas or heights of nearest internal standards) are subjected to mass spectral library searches for tentative identification.

Time - when required to record time on any deliverable item, time shall be expressed as Military Time, i.e., a 24-hour clock.

Trip Blank - a sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures.

Validated Time of Sample Receipt (VTSR) - the date on which a sample is received at the laboratory facility, as recorded on the shipper's delivery receipt and chain-of-custody.

Volatile Compounds - compounds amenable to analysis by the purge and trap technique. Used synonymously with purgeable compounds.

Wet Weight - the weight of a sample aliquot including moisture (undried).

APPENDIX D TEQ CALCULATION FOR DIOXIN/FURAN

The 2,3,78-TCDD equivalent for a congener is obtained by multiplying the concentration of that congener by its Toxicity Equivalency Factor (TEF) from the table below. The TEQ is the sum of the products.

CONGENER	TEF
2,3,78 -Tetrachlorodibenzo-p-dioxin	1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01
Octachlorodibenzo-p-dioxin	0.001
2,3,7,8-Tetrachlorodibenzofuran	0.1
1,2,3,7,8-Pentachlorodibenzofuran	0.05
2,3,4,7,8-Pentachlorodibenzofuran	0.5
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01
Octachlorodibenzofuran	0.001

TEQ calculation as per: NATO.1988. International Toxicity Equivalency Factors (I-TEF) Method of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. North Atlantic Treaty Organization. Report Number 176.

Known standards and guidelines are based on the method outlined above. In 1998 an expert meeting of the WHO was held to derive consensus TEF's for dioxins/furans and dioxin-like PCB's. A new list of TEF's was recommended which included values for humans, mammals, fish and birds. A copy of these numbers is available in:

Environmental Health Perspectives, December 1998. Toxic Equivalency Factors (TEFs) for PCB's, PCDD's, PCDF's for Humans and Wildlife. Volume 106, Number 12.

APPENDIX E SUM OF PAH'S

PAH’s in sum of PAH’s

Acenaphthene
Acenaphthylene
Anthracene
Benz(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
2-Chloronaphthalene
Chrysene
Dibenz(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-c,d)-pyrene
2-Methylnaphthalene
Naphthalene
Phenanthrene
Pyrene

The sum of the concentrations of these eighteen PAH analytes are used to calculate the sum of PAH for Table 2. If one or more analytes are missing from the list, sum the remaining analytes for the calculation of sum of PAH.

APPENDIX F BIOLOGICAL TESTING OF DREDGED MATERIAL

Although the Divisions do not routinely require biological testing, the Army Corps of Engineers (USACE) may require applicants to conduct a suite of biological tests to support their federal dredging permit application. If such test results are available and considered sufficient to characterize the material to be dredged, and especially if open water placement is planned, the Divisions may elect to use this information in lieu of or in addition to whole sediment chemistry analytical results to make permit decisions. The following sections describe biological testing and the application of test results.

A. Water Column (Suspended Phase) Evaluations

Federal dredging guidance requires preparation of a suspended particulate phase for bioassay testing with water column organisms. The suspended phase is the supernatant after 1 hour of settling following 30 minutes mixing of 1 part of sediment with 4 parts of dredging site water. Dilution series of 100, 50, 10 and 0% are prepared for the suspended phase toxicity tests to enable calculation of an LC-50 or EC-50 for three test organisms. The results of these toxicity tests can be used after applying mixing considerations and resource concerns at the dredging and placement sites. Water chemistry elutriate analyses are also conducted on a filtrate (0.45 um filter) of the suspended particulate phase to compare with water quality criteria. The results of both tests above are interpreted by USEPA/USACE using numerical modeling methods which simulate the hydrology and topography at the placement site. In federal determinations, the measured toxicity in the suspended phase has a 0.01 safety factor applied to calculate a Limiting Permissible Concentration (LPC), which is then applied in a mixing model to determine compliance with a 4 hour mixing zone at the placement site. For evaluations of dredging and placement operations, the LC/EC-50s and elutriate results can be applied by using a mixing zone analysis as described in Chapter V, Section C.

B. Benthic (Solid Phase) Evaluations

In federal dredging assessments, test results are compared to organisms exposed to a reference sediment for a designated placement site. Both the solid phase toxicity and bioaccumulation test results can be evaluated with regard to the potential for adverse impacts from newly exposed sediments at the dredge site, resettling of suspended solids at the dredge site, and at the in-water placement site.

i. Solid phase toxicity tests

When low reference survivorship is allowed to be used to evaluate the tests (a 20% difference from reference is allowed for amphipod test, and there is no established limit for reference survivorship), this should be considered in light of what would be an acceptable reference result for the dredging and placement sites. Significant toxicity in federal solid phase tests typically disqualifies dredged material from in-water placement. Disposal of such material within any State aquatic site would require positive placement, a comprehensive capping program and significant coordination. Any such project would be likely to require all available BMP permit conditions.

A lack of toxicity in solid phase tests does not itself automatically allow dredged material to be considered class A, as toxicity may still be demonstrated in the suspended phase or in the bioaccumulation portion of the solid phase tests. In addition, sediment quality thresholds may be exceeded to such an extent that the material cannot be confidently described as Class A.

The toxicity tests will be based on acute effects and follow EPA and ASTM standard methods. Using freshwater sediments, the test species should be *Hyalella azteca* and *Chironomus tentans* (ASTM Method E 1706). The endpoint for *Hyalella* is survival, while *Chironomus* is growth (weight) and survival. These species are recommended because they are widely used, easy to culture, and are highly tolerant to changes in grain size. The test should consist of five replicate samples for statistical comparison and be conducted in accordance with the standard methods. The results of the test should indicate whether the test sediments are statistically different from the reference sediment. ASTM (E 1383) provides ways to calculate these results.

For marine sediments, the acute toxicity bioassay test species should be the amphipod *Ampelisca abdita* (ASTM Method E 1367) and a polychaete *Neanthes arenaceodentata* (ASTM Method E 1611) or the mysid shrimp *Mysidopsis bahia*. Survival is the endpoint for these two species using the 10-day test. The results of these two tests should indicate whether the test sediments are statistically different from the reference sediment. ASTM (E 1383) provides ways to calculate these results. A solid phase chronic toxicity test using *Leptocheirus* has been developed by EPA. This test is outlined in "Methods for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-associated Contaminants with the Amphipod *Leptocheirus plumulosus* EPA/600/R-01-020, March 2001." Since this test is relatively new, it may not be cost effective for the applicant. However, the applicant has the option to use this chronic test to support the results of other biological tests.

These biological testing protocols are further detailed in a NYSDEC Division of Water document "Biological Assessment of Sediments in New York State - 1998".

ii. Solid phase bioaccumulation assays

Federal bioaccumulation testing for dredged material typically includes an extensive list of bioaccumulative contaminants of concern. Effects-based (ecological or human health) limits derived from scientific literature, as well as exposure considerations, are used to develop tissue guidelines. Divisions will need to consider any available field background tissue concentrations and exposure considerations for the dredging and placement sites to evaluate potential bioaccumulation impacts. To independently evaluate the toxicological aspects, literature values should be selected from studies that compared effects to *tissue* concentrations, as opposed to *exposure water* concentrations. For some contaminants, data for organisms that are as close as possible to, but not necessarily the same as the species at risk, will need to be used.

APPENDIX G GLOSSARY

GLOSSARY

ambient conditions - the conditions present at a given site based on chemical, physical and biological assessments.

anaerobic - able to live, and grow in the absence of free oxygen.

baffle - a device (as a plate, wall or screen) to deflect, check, or regulate flow.

beneficial use - material being used beneficially pursuant to section 6 NYCRR Part 360-1.15 and removed from the definition of a solid waste, and therefore the jurisdiction of Part 360, as per 6 NYCRR Part 360 - 1.2(a)(4)(vii).

benthic - of, relating to, or occurring at the bottom of a water body; relating to sediments.
benthos - organisms that live on or in the bottom of a water body.

best management practices (BMPs) - methods and measures employed during dredging or dredged material management to minimize adverse environmental impacts.

bioaccumulation - the progressive increase in the amount of a chemical in an organism through any route including respiration, ingestion, or direct contact with sediment or water.

borrow pit - an excavated area where material has been dug for use at another location.

confined disposal facility - for the purposes of this TOGS, a diked area, either in-water or in a riparian area, used to contain dredged material.

containment area - any location or site used for the permanent or temporary placement of dredged material which may or may not have structures designed to prevent contact with water or terrestrial environment.

data qualifier - a word or symbol that limits or modifies the meaning of analytical results.

dewatering - the practice of removing water from a waste product or dredged material , which can be performed actively or passively.

dioxin - a toxic chlorinated hydrocarbon which occurs as an impurity in the herbicide 2,4,5-T.

dredging - for the purposes of this document the term dredging includes all in-water activities designed to move or remove sediment. Examples of such activities include but are not limited to mechanical and hydraulic dredging, mechanical plowing, trenching and jetting.

dredged material - the sediments under a body of water removed during a dredging operation and displaced or removed to a management location.

effluent - waste material discharged into the environment, especially when serving as a pollutant; applies to the water discharged over the weir of a confined disposal facility for dredged material or from a dredged material dewatering facility.

fines - sediment (silt and clay) that passes through the 200 U.S. standard sieve mesh or material with a grain size of 0.0625 mm or less.

guidelines - are published in TOGS and other internal documents but do not have the force and effect of a law.

guidance - refers to either national or regional implementation manuals developed to assist the evaluator in making technical decisions.

hazardous waste - any material meeting the definition of a hazardous waste as defined in 6NYCRR part 371.

homogenize (as in *sample homogenization*) - to make more uniform throughout in texture, mixture, quality, etc. by breaking down and blending the particles.

hydraulic dredging - removing sediment from the bottom of a water body or the sea with the use of suction equipment.

interstitial - referring to the interstices, or pore spaces in rock, soil, or other material subject to filling by water.

littoral - a coastal region; the shore zone between high and low watermarks.

loading - the quantity of a material or substance entering a system.

mixing zone - the area in a water body where a temporary exceedances of water quality standards resulting from short-term disruptions to the water body caused by dredging or the placement of dredged material will be accepted.

modeling - a system of postulates, data, and inferences presented as a mathematical description to both describe and predict a system which can not be easily observed.

navigable waters (of the State) - (NY State definition) means all lakes, rivers, streams and other bodies of water in the State that are navigable in fact or upon which vessels with a capacity of one or more persons can be operated notwithstanding interruptions to navigation by artificial structures, shallows, rapids or other obstructions, or by seasonal variations in capacity to support navigation. It does not include waters that are surrounded by land held in single private ownership at every point in their total area.

navigable waters - (EPA definition) means the waters of the United States, including the territorial seas.

outfall - the mouth of a drain or sewer.

parameter of concern - a substance that exceeds a threshold value for assessment.

persistent - refers to the transformation half life of a chemical in the environment (EPA defines as greater than 6 months in soils and sediment).

polychlorinated biphenyls (PCBs) - one of several aromatic compounds containing two benzene nuclei with two or more substituent chlorine atoms. They are colorless, toxic, viscous liquids. Because of their persistance and ecological damage from water pollution, their manufacture has been discontinued in the US (1976).

polycyclic aromatic hydrocarbons (PAHs) - hydrocarbons are an organic compound consisting exclusively of the elements hydrogen and carbon. Polycyclic hydrocarbons are made up of four or more ring structures. Aromatic refers to their strong and not unpleasant odor. PAH's are derived principally from petroleum and coal tar sources and some have demonstrated carcinogenic properties.

protected stream - means any stream or particular portion of a stream for which there has been adopted by the Department or any of its predecessors any of the following classifications or standards: AA, AA(t), A, A(t), B, B(t) or C(t). Streams designated (t)(trout) also include those more specifically designated (ts)(trout spawning).

riparian - land areas directly influenced by a body of water; usually pertains to the banks of a river, stream, or waterway that have visible vegetation or a physical characteristic showing influence by a water body. For the purpose of this TOGS is defined as the 100 year flood plain plus any adjacent wetland integral to the surface water (U.S. vs. Riverside Bayview Homes, Inc., 474 U.S. 121, 106 S. Ct. 455 (1985).

riparian diked site - see confined disposal facility.

silt - loose sedimentary material with rock particles measuring 4 to 62.5 micrometers in diameter.

sediment quality criteria - numeric, effects-based concentrations that provide an interpretive tool to relate ambient sediment chemistry data to potential adverse biological impacts.

standard - form the legal basis for controls on the amount of pollutants entering the environment from various sources.

stratification (of sediments) - the formation of distinct layers of sediments having the same general composition (grain size, quality), arranged one on top of another.

substrate - the base on which an organism lives.

surfactant - a compound that reduces surface tension (as a detergent).

Toxicity Characteristic Leaching Procedure (TCLP) - A test that measures the mobility of organic and inorganic chemical contaminants in wastes (see - SW846 method 1311).

Total Organic Carbon (TOC) - the amount of carbon covalently bound in organic compounds.

upland - beyond the FEMA designated 100 year flood plain.

weir (controlled outlet weir) - structure which raises the water level or diverts water flow.

wetlands - under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

freshwater wetlands -(NYSDEC definition) - "Freshwater wetlands" or "wetlands" means lands and waters of the state which meet the definition provided in subdivision 24-0107(1) of the Freshwater Wetlands Act and have an area of at least 12.4 acres (approximately 5 hectares) or, if smaller, have unusual local importance as determined by the Commissioner pursuant to subdivision 24-0301(1) of the Freshwater Wetlands Act and 6NYCRR Part 664.

tidal wetlands -(NYSDEC definition) , Generally, tidal wetlands or wetland shall mean any lands delineated as tidal wetlands on an inventory map and shall comprise the following classifications as delineated on such map: Coastal fresh marsh; intertidal marsh; coastal shoals, bars and flats; littoral zone; high marsh or salt meadow; or formerly connected tidal wetlands. Tidal wetlands are more fully defined in ECL §25-0103(1) and its implementing regulations.

whole sediment chemistry - the analytical quantification of target analytes in sediments being dredged or proposed for dredging.

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APPENDIX D:
Supply List for Iron Point Sediment Sampling

SUPPLY LIST FOR SEDIMENT SAMPLE COLLECTION:

Multi-stage sediment sampler (AMS Inc., American Falls, Idaho)

AMS soil sample liners (AMS Inc. American Falls Idaho)

Sample Containers (obtained from analytical laboratory at least one day prior to sample collection date)

Pre-completed sample labels (Labels shall be obtained from analytical laboratory and completed prior to sample collection to ensure cleanliness and legibility of labels. Only time of sample collection should be added to pre-completed label after sample collection).

Chain of Custody forms (obtained from analytical laboratory and completed prior to sample collection to ensure legibility and cleanliness of COC forms. Only time of sample collection should be added to pre-completed COC form after sample collection).

Clear Transparent Polypropylene Envelope File Folders with String-Tie Closure to store/protect pre-completed labels and COC forms

Large laboratory spatulas.

(2) 5 gallon plastic buckets. One for sample homogenization and one for sampling equipment decontamination.

Phosphate-free laboratory detergent (Liquinox by Alconox (Jersey City, NJ) or equivalent)

Long-handled scrub brushes.

24" Bottle brush.

Minimum of 3 gallons of clean tap water

6 ft x 8 ft woven poly tarp.

Nitrile gloves (1 box per sampling event).

48-QT cooler and three 10lb bags of ice.
Field notebook and pens/permanent markers.
Field references/guides (Munsell Soil Color Chart and USDA Field Book for Describing and Sampling Soils).

Notes:

1. All equipment unless otherwise noted shall be stored and maintained at Land Use Ecological Services office at 570 Expressway Drive South, Medford NY 11763 and maintained by William P. Bowman.
2. Soil sampling is necessary for Iron Point Wetland Restoration project.

APPENDIX E:
Sample Field Data Forms

Channel Reconnaissance Form

Date				
Stream/Drainage				
Stream Reach ID				
Field Team		**Station**		**To**

General Channel Conditions

Channel Shape (check)
- ☐Rectangular
- ☐Shallow Rectangular
- ☐Irregular
- ☐Trapezoidal
- ☐Parabolic
- ☐Other _____

Sediment Particle Size Estimate	
Banks	
Bars	
Bed	

Bar Types: ☐Alternate lateral ☐Point / transverse ☐None ☐Mid-channel ☐Point / mid ☐Point / alternate

Fluvial Geomorphic Conditions

Vertical Stability *degradation/aggradation*					
Lateral stability *deposition, erosion*					
Erosion (excessive/site specific)					
Dominant bank erosion types (circle any that apply)	*Fluvial*	☐Undercut / cantilever	☐Selective erosion of noncohesive laters	☐Dry flow	☐Seepage
	Gravitational	☐Rotational	☐Planar	☐Wedge	
Bank composition	*Notes (shape/character)*:				
Terrace/Valley	*Valley form –*		*Land Use –*		
Altered state (human) - dams, bridges, canoe landings, parks, etc.					
Bankfull/Channel forming flow indication					

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Sediment Impacts			
Riffle sediment type		Pool sediment type	
Sorting / Imbrication			
Bars / depositional features			
Sediment type/size			
Mid, alternate, braided			
Bar Vegetation (type, age)			
Floodplain soils			
Overbank deposition			

Riparian Vegetation and Floodplain

Root coverage of banks (%)	
Width of veg. riparian corridor*	
Canopy coverage (%)	

** Verify with orthoquad data*

Canopy structure : (check one)

none = anthro / maintained (lawn, field, pasture)	
low = single canopy layer	
medium = at least two canopy layers	
high = multiple canopy layers	

Primary veg forms present: (%)		Woody Species present	% of total tree community
grasses/forbs			
woody species			
bare/other			
Exotic/invasive species			

Tree Stand Age (if applicable)

Station	*Species*	*Age*	*Notes / Location within XS*

Riparian Landuse

General Riparian Notes:

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Channel Stability Form

Reach stability		**1-2 Degrading**		**3 Stable**		**4-5 Aggrading**
Estimated sediment mobility (D50 moves at:)	<2yr Q		2-10 yr		>10 yr	
Substrate consolidation	Strong, gravels/cobble		Strong, gravels		Weak, sand/silt	
Bank failure mechanism	High banks, grav. collapse, variable channel width		Localized surficial erosion, constant width		Low banks, overflows, surficial erosion	
Bar development	Poorly formed		Narrow, vegetated		Wide (>1/2 channel length), unveg.	
Bank erosion extent	Extensive		Local erosion/pools		Extensive bar pressure	
Relative Width:Depth ratio	Low		Average		High	
Channel pattern	Single thread		Single thread		Multiple thread/braided	
Average bank slope	<3:1		>3:1			
Vegetative bank protection	Poor		Extensive		Poor	
Field stability rating (add all cells)/9		**=**				

Representative cross-section sketch		
Bankfull width = Bankfull depth =	Floodplain width =	Water depth (at survey) = Water width (at survey) =
Station:		
Station:		

GENERAL REACH NOTES

POTENTIAL PROJECTS

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Photos

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WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: _____ City/County: _____ Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: _____

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** _____ If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

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1. PROJECT MANAGEMENT

This section of the Quality Assurance Project Plan addresses the project management components associated with the project.

1.1 INTRODUCTION TO QUALITY ASSURANCE PROJECT PLAN

The purpose of this Quality Assurance Project Plan (QAPP) is to ensure that the environmental data collection and recording procedures are sufficient to ensure that the resulting products and deliverables will meet project objectives. The document will provide a review of the environmental data collection procedures and review of the collected environmental data to assure the procedures outlined are followed. Upon providing a signature on pages 2-3 of this document, project participants and Quality Assurance managers agree that if the QA procedures outlined herein are adhered to, project delivables will be of suitable quality.

1.2 DISTRIBUTION LIST AND TECHNICAL ADVISORY COMMITTEE

The individuals listed below (Table 1) will receive original copies of the approved Quality Assurance Project Plan (QAPP).

Table 1 includes all individuals directly responsible for project implementation or US EPA review and approval of the QAPP.

Table 1. Parties Responsible for Project Implementation

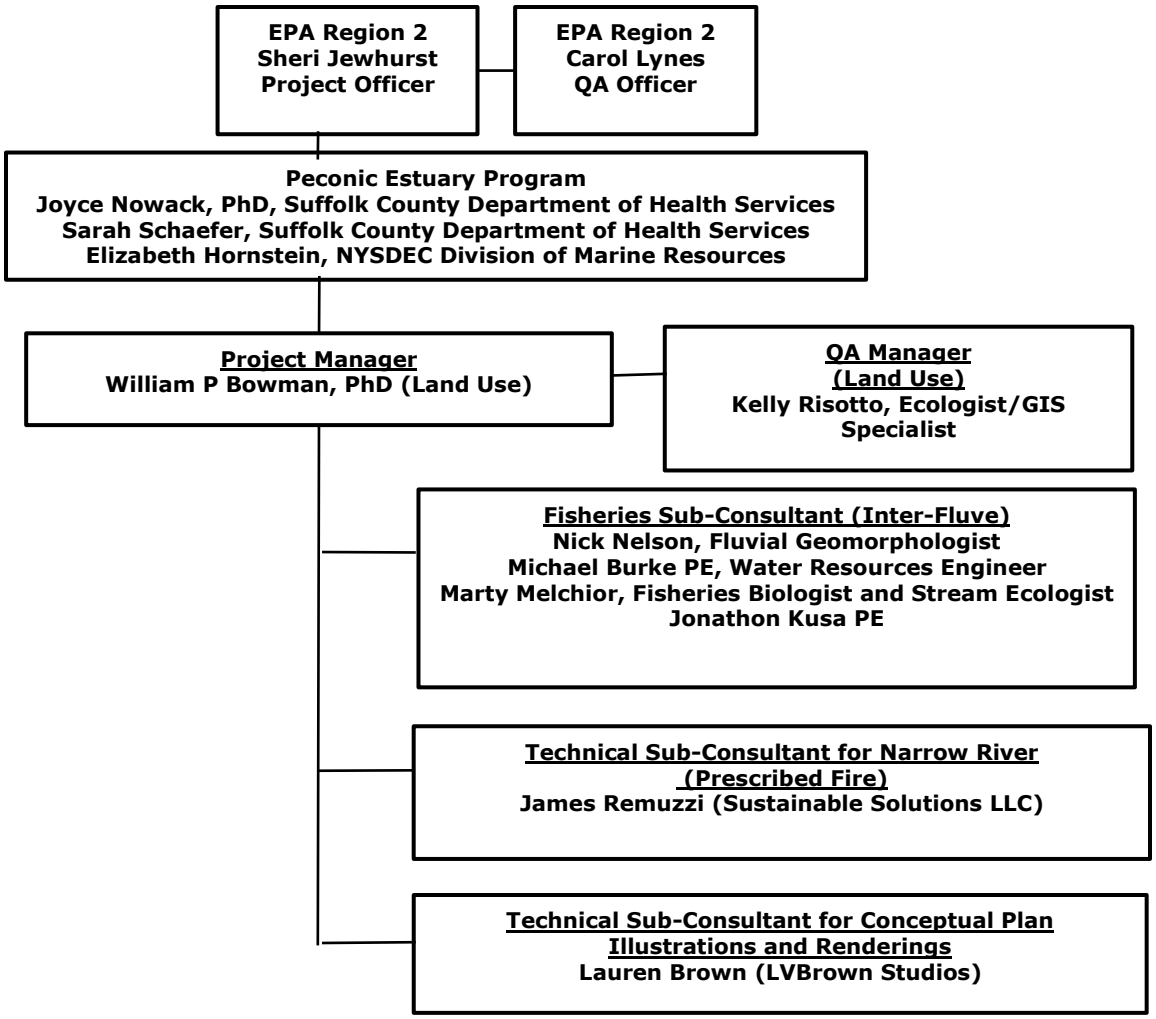
Name	Title	Organization	Contact Information
Sheri Jewhurst	Project Officer	EPA Region 2	290 Broadway New York, NY 10007-1866 jewhurst.sheri@epa.gov
Carol Lynes	QA Manager/ Team Leader Air and Water Quality Assurance Team	EPA Region 2	U.S. EPA Region 2 DESA/MAB (MS 220) 2890 Woodbridge Avenue Edison, NJ 08837-3679 lynes.carol@epa.gov
Joyce Novack	Program Director, Peconic Estuary Program	Suffolk County Department of Health Services	360 Yaphank Ave, Suite 2B Yaphank, NY 11908 631-852-2961 joyce.novack@suffolkcountyny.gov
Sarah Schaefer	NEIWPCC Analyst, Program Coordinator, Peconic Estuary Program	Suffolk County Department of Health Services	360 Yaphank Ave, Suite 2B Yaphank, NY 11908 631-852-5806 sarah.schaefer@suffolkcountyny.gov
Elizabeth Hornstein	NEIWPCC Analyst, State Coordinator, Peconic Estuary Program	NYSDEC, Division of Marine Resources	205 North Belle Mead Road, Suite 1 East Setauket, NY 11733 631-444-0871 elizabeth.hornstein@dec.ny.gov

William Bowman	Project Manager, Senior Scientist	Land Use Ecological Services	570 Expressway Drive South, Suite 2F Medford, NY 11763 631-727-2400 wbowman@landuse.us
Kelly Risotto	QA Manager, Senior Scientist	Land Use Ecological Services	570 Expressway Drive South, Suite 2F Medford, NY 11763 631-727-2400 krisotto@landuse.us
Nick Nelson	Geomorphologist	Inter-Fluve	220 Concord Avenue, 2nd Floor | Cambridge, MA 02138 617-714-5537 nnelson@interfluve.com

1.3 PROJECT ORGANIZATION

This section provides an overview of the organizations involved in this project and the roles and responsibilities of the individuals within each organization. The primary organizations involved include the U.S. EPA, Suffolk County and NYSDEC, Land Use Ecological Services, Inc. and Inter-Fluve, Inc. Below (Figure 1) is an illustration of the overall organizational relationship between key personnel within these agencies. The specific responsibilities and key personnel assigned to this project are described in detail below.

Figure 1. Project Organizational Chart



The **Peconic Estuary Program (PEP)** is the lead agency in this project. Key personnel include:

Joyce Nowack, Sarah Schaefer, and Elizabeth Hornstein – Dr. Nowack, Ms. Schaefer, and Ms. Hornstein will oversee the progress of the project and will monitor project activities to ensure their adherence to the approved QAPP and contract terms.

The **United States Environmental Protection Agency (EPA Region 2)** will review the project's QAPP. No field data collection shall begin until ERA Region 2 approval of the QAPP is received. Key personnel include:

Sheri Jewhurst, Project Officer – As Project Officer, Ms. Jewhurst will review and approve the QAPP and final project deliverables to ensure their consistency with the environmental outputs and outcomes expected to result from this project.

Carol Lynes, Quality Assurance Officer – Will review and approve the QAPP on behalf of the EPA Region 2 QA Unit.

Land Use Ecological Services is the lead contractor that will be performing the project work.

Land Use Ecological Services will act as the lead consultant in all aspects of the project, including QAPP development; environmental data collection and site research and analysis; coordination and preparation of *Interim Presentations on Existing Conditions and Schematic Designs* for all four sub-projects; coordination and preparation of recommendations and conceptual habitat restoration plans for all four sub-projects; coordination and scheduling of kick-off meetings, interim progress meeting, and wrap-up meeting; and production and submission of final deliverable reports. Key personnel include:

William Bowman, Project Manager – Dr. Bowman will be responsible for ensuring that the all tasks are completed in a timely, professional and cost-effective manner; he will also be the primary point of contact between the project team and Suffolk County. In particular, the Project Manager, who is an expert in Long Island's terrestrial and wetland ecosystems, will directly oversee the field research and environmental data collection, preparation of schematic designs and incorporation of feedback and comments from project partners, and development of final recommendations and conceptual designs for the four restoration designs.

Kelly Risotto, Quality Manager – As the QA/QC Manager for this project, Ms. Risotto be responsible for developing the QAPP, for ensuring that the QAPP is fully implemented during all phases of the project related to collection and analysis of environmental data, for reporting any deficiencies to project management at Suffolk County, and for generally overseeing all QA/QC related activities.

Land Use shall utilize approved sub-contractors to provide specific technical expertise related to several aspects of the project.

Inter-Fluve, Inc., a sub-consultant to the project, will be involved in the field research and environmental data collection, schematic design preparation, and final recommendations and conceptual designs for fish passage improvements, tidal hydrology restoration, and stormwater management. Key personnel include:

Nick Nelson, Geomorphologist – Mr. Nelson is the project team's expert in hydrology and aquatic habitat and fish passage restoration. He and his team conduct will conduct field research and environmental data collection at the Narrow River, Lake Montauk, and Main Road MH-2 restoration sites and be responsible for contributing to the production of schematic designs and the final conceptual plans for these three sites and assist the Project Manager with the preparation of the final report and recommendations.

Marty Melchior, Michael Burke, and Jonathon Kusa, Project Support – Mr. Melchior, Mr. Burke, and Mr. Kusa will assist Mr. Nelson with the preparation of schematic and conceptual designs for the fish passage restoration (Melchior), tidal hydrology restoration (Burke), and stormwater management (Kusa) projects.

James Remuzzi (Sustainable Solutions LLC) is prescribed fire Burn Boss who will serve as a technical consultant in assessing the feasibility and implementation logistics of utilizing prescribed fire (solely or in conjunction with tidal hydrology restoration) to manage invasive *Phragmites* at the Narrow River project site.

Lauren Brown, ASLA, LEED AP (LVBrown Studios) is an illustrator and graphic designer. Ms. Brown shall serve as a sub-contractor that will contribute to the development of high-quality, visually-appealing conceptual plans and renderings of the recommended restoration actions.

1.4 PROBLEM DEFINITION/BACKGROUND

The Peconic Estuary (PE) is one of 28 designated "Estuaries of National Significance" under Section 320 of the Federal Clean Water Act. One of the goals in the Peconic Estuary Program (PEP)'s approved Comprehensive Conservation and Management Plan is to restore and enhance degraded habitats within the PE watershed and improve the quantitative and qualitative functions and services they provide. In 1997, the PEP Habitat Restoration Workgroup (HRWG) was formed and charged with identifying important Peconic natural habitats with enhancement or restoration potential, developing overall habitat restoration goals, and identifying and prioritizing potential restoration projects. In 2000, the HRWG finalized the Habitat Restoration Plan for the PE which indentifies 72 sites in need of restoration. In 2009, the PEP Natural Resources Subcommittee (NRS) initiated efforts to assess the status and remaining restoration needs at sites included in the 2000 PEP Habitat Restoration Plan, to identify new candidate sites for restoration, and to develop a 2009 PEP Habitat Restoration Plan. In 2014, the 2014 Implementation Progress Report: Habitat Restoration Plan reported that of the seventy-one (71) projects listed in the 2009 Habitat Restoration Plan, plus an additional three (3) projects that have commenced or have been completed since 2009, for a total of seventy-four (74) projects. In support of implementing the 2009 PEP Habitat Restoration Plan and completing the thirty-two (32) projects listed as not yet initiated in the 2014 Implementation Progress Report: Habitat Restoration Plan, the PEP NRS has identified four (4) sites which require additional site investigations and conceptual designs before implementation funding is sought. The four (4) selected and approved projects are: Narrow River Road Hydrological Improvements and *Phragmites* Management, Iron Point Wetland Restoration, Lake Montauk Alewife Access and Habitat Enhancement, and MH-2 Main Road Wetland Construction.

This project shall focus on developing separate Conceptual Habitat Restoration Design Plans for these four sites. Field research shall include collection of information on existing biological, hydrological, and physical conditions, described in detail in *Section 1.5.2*, at each of the four sites. Findings to be presented to Peconic Estuary Program shall include: narrative descriptions of existing site conditions, existing and created maps and diagrams for analysis, and photos of the existing site and conditions. The project team shall establish a framework

of recommendations and the development of schematic designs for actions at each site. The final recommendations and conceptual restoration plan for each site will provide narrative text and illustrative drawings depicting what the restoration site might look like subsequent to project construction. Each site narrative must include information necessary to implement the final conceptual plan including: actions to be taken, estimates of materials needed, implementation objectives, phasing plans, possible required permits, and preliminary cost estimates.

1.5 PROJECT TASKS

1.5.1 Task One - Prepare a Quality Assurance Project Plan

The collection and use of environmental data for the four selected ecological restoration projects shall be consistent with a USEPA-approved *Quality Assurance Project Plan (*QAPP) developed by Land Use Ecological Services. Sample collection and analysis are not required for the development of conceptual restoration plans for three of the project sites. Limited sediment sampling and laboratory analysis will be completed for the Iron Point wetland restoration project.

Environmental data shall consist of the collection and use of GIS data to document existing environmental conditions and the collection of basic dimensional measurements for the each of the four restoration plans. Collected GIS data will include locations of potential fish passage barriers; culverts, outfalls, or stormwater drainage infrastructure; boundaries of ecological communities or other important ecological features such as tidal or freshwater wetland features, boundaries of invasive plant stands/infestations, marsh ditches or channels, or top/bottom of slopes, berms, or banks; hazardous fuel accumulations; locations of utilities or other infrastructure; and potential site access/egress paths. Environmental and site data that may be collected for these projects would include simple in-field measurements of the dimensions of the previously described features such as stream width above and below a potential fish barrier or culvert, stream water depth above and below the potential fish barrier or culvert, culvert dimensions, stream/channel width or depth, relative vertical distance (e.g. vertical distance between the upstream and downstream ends of a culvert) to prepare conceptual cross-sections of recommended restoration actions, and water velocity.

All GIS data produced will adhere to the requirements of EPA's National Geospatial Data Policy (NGDP) (United States EPA, 2008). In addition, secondary GIS data shall be obtained from the New York State GIS Clearinghouse and/or local municipalities. The QA Manager for the project shall be Ms. Kelly Risotto, as indicated on the provided Project Organization Chart.

1.5.2 Tasks Two through Four – Research & Site Analysis, Vision & Schematic Designs, Recommendations & Conceptual Habitat Restoration Plans for Narrow River Road, Iron Point, Lake Montauk, and Main Road MH-2 Sites

The following section describes the technical approach that will be employed for the field investigations and analysis of the existing field conditions at each project site and an outline of

the deliverables, including restoration recommendations and conceptual designs, for each project site. General location maps for each of the sites are provided in Appendix A.

i. Narrow River Road

Hydrological barriers and invasive *Phragmites australis* infestations at Broad Meadows and Whitcom marshes in the headwaters of Narrow River shall be evaluated by William Bowman, PhD of Land Use, Nick Nelson of Inter-Fluve, and James Remuzzi of Sustainable Solutions through on-site field inspection and collection of pertinent environmental data. Emphasis will be on the identified culverts that restrict tidal flow into these marshes, specifically the double culvert with malfunctioning tide gate at the downstream limit of Broad Meadows Marsh and the culvert under Route 25 between Broad Meadow Marsh and Whitcom Marsh. Field investigations shall be completed in summer of 2018.

Data to be collected during field inspection of Narrow River shall include:

- GPS locations of all pertinent structures and ecological features. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Dimensional measurements, observations, and hydraulic data required to adequately characterize each structure including dimensions and materials of culverts, invert and earthen dam elevations, and vertical drop. Measurement accuracy and procedures are presented in *Section 1.9.2(ii) and 2.2.2*;
- Spring High Water and Tidal Wetland Boundary elevations downstream of culverts based on nearby tidal wetlands communities;
- GPS locations of invasive plant stands, native ecological community boundaries (following ecological community descriptions in Edinger et al (2014)), potential locations for fire lines and drafting points to implemented for prescribed fire; mapping of onsite fuels conditions, including identification of hazardous fuel accumulations adjacent to *Phragmites* that would need to be pre-treated prior to introducing prescribed fire; and potential site access/egress routes;
- GPS locations of suitable habitat for any rare and protected wildlife and flora listed by the New York State Natural Heritage Program as known to occur in the immediate vicinity of Broad Meadow or Whitcom Marshes.
- Site photographs

The project team shall also obtain, review, and utilize available GIS data from the Town of Southold, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions and to prepare a topographic map of the Broad Meadows-Whitcom Marsh complex including:

- High resolution orthoimagery,
- 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography, and
- Suffolk County real property records to access property ownership.

The project shall develop a schematic design for improving tidal flow and implementation of prescribed fire at Broad Meadows and Whitcom Marshes. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail (e.g. 0.5 ft resolution orthoimagery available from NYS GIS Clearinghouse) to

promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use and Nick Nelson of Inter-Fluve.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for the improvement of tidal flow, implementation of prescribed fire, and prioritization of ecological restoration actions.

The final recommendations report shall include:

- Site Map of Narrow River and Broad Meadow-Whitcom Marshes and surrounding area based on GPS data collected by Project Team and GIS data available from NOAA, New York State, Suffolk County, and Town of Southold;
- Site topography based on LIDAR data;
- Mapped extent of Phragmites marsh and identification of adjacent ecological communities based on field delineation and existing aerial imagery;
- Map of adjacent existing land uses and property ownership based on Suffolk County GIS data;
- Site Photographs;
- Habitat recommendations, corrective actions, and objectives;
- Recommendations for stakeholder outreach needed to implement prescribed fire;
- Potential site access routes and work staging areas;
- Existing infrastructure that may be impacted;
- Preliminary cost estimates for primary culvert modifications and prescribed fire implementation
- Environmental permitting requirements
- Assessment of potential impacts of tidal flow improvements to nearby infrastructure and agricultural lands due to coastal flooding

The final concept drawings prepared by the project team shall present:

- Overview aerial of entire project area noting the location of individual sites of recommend restoration actions.
- Visual illustration of the strategy for culvert modification, repair, or removal to provide tidal flow restoration
- Close-up of each potential work site showing existing and proposed conditions including infrastructure, access routes, potential remediation work areas, work limits, sensitive ecological resources, and property boundaries
- Plan view locations of safety zones, firelines, and no fire areas for fire restoration projects
- Plan-view locations of existing and proposed ecological habitat types

ii. Iron Point Wetland Restoration

Existing ecological conditions in Iron Point marsh including distribution of native marsh communities, *Phragmites* infestations, and pannes/ponds; existing ditch locations and dimensions, and barriers to tidal exchange shall be evaluated by William Bowman, PhD of Land Use. Field investigations shall be completed in summer of 2018.

Data to be collected during field investigations of Iron Point shall include:

- GIS Mapping of marsh community boundaries (following Edinger et al. 2014) and other pertinent ecological features. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Quantification of existing total marsh area, existing intertidal and high marsh areas, existing marsh pond/panne areas, and existing *Phragmites* marsh area;
- Existing berm, berm gap, and marsh ditch dimensions and existing elevation and relative vertical distance of existing marsh communities. Measurement accuracy and procedures are presented in *Section 1.9.2(ii) and 2.2.2*;
- Potential Access Routes and Plant Community Composition in Potential Access Routes;
- GPS locations of suitable habitat for any rare and protected wildlife and flora listed by the New York State Natural Heritage Program as known to occur in the immediate vicinity of Iron Point marsh or observations of rare and protected wildlife and flora.
- Collection of two (2) marsh sediment samples and analysis for contaminant concentrations. Sediment sampling and analytical procedures are presented in *Sections 1.9.2(iii) and 2.2.3*;
- Site Photographs.

The project team shall also obtain, review, and utilize available GIS data from the Town of Southampton, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions and to prepare a topographic map of the Iron Point marsh complex including:

- High resolution orthoimagery,
- 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography, and
- Suffolk County real property records to access property ownership.

The project shall develop a schematic design for improving tidal flow and controlling invasive *Phragmites* by construction of new marsh channels or expansion of existing marsh ditches. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail (e.g. 0.5 ft resolution orthoimagery available from NYS GIS Clearinghouse) to promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for marsh channel construction, reasoning for recommendations, expected obstacles and advantages, and summary of sediment analytical results and implications for disposal or re-use of excavated sediments.

The final recommendations report shall include:

- Site Map of Iron Point Marsh and surrounding uplands based on GPS data collected by Project Team and GIS data available from NOAA, New York State, Suffolk County, and

Town of Southampton;
- Site topographic map based on LIDAR data;
- Ecological communities map based on field delineation of community boundaries. GPS locations of suitable habitat or documented observations of any rare and protected wildlife, flora, or ecological communities listed by the New York Natural Heritage Program;
- Habitat recommendations, corrective actions, and objectives;
- Locations for recommended new berm gaps and marsh channels;
- Potential site access routes and work staging areas with adequate physical separation from pilot permeable reactive barrier project (location identified in Appendix B);
- Results of sediment borings and laboratory analyses;
- Preliminary cost estimates for design and construction;
- Environmental permitting requirements and additional sediment testing requirements for regulatory approval;
- Site Photographs;

The final concept drawings prepared by the project team shall present:
- Sheet 1 – Overview aerial of entire project area noting existing proposed conditions
- Sheets 2-3– Plan and section views of proposed condition including recommended berm gaps and marsh channels, access routes, work limits, sensitive ecological resources and infrastructure, and property boundaries
- Sheet 4- Typical details of proposed work.

iii. Lake Montauk Alewife Access and Habitat Enhancement

Fish passage conditions between Lake Montauk and Stepping Stones Pond and Big Reed/Little Reed Ponds shall be evaluated by Nick Nelson and Michael Burke of Inter-Fluve through on-site field inspection and collection of pertinent environmental data. Potential barriers to fish passage include culverts, shallow stream reaches, and dense stands of emergent vegetation. Our team shall determine if each of these potential barriers between Lake Montauk and either Stepping Stones Pond or Big Reed Pond serves as an actual barrier to migratory fish. William Bowman, PhD of Land Use shall be responsible for wetland delineations, ecological community mapping, and assessment of potential impacts to NYS-protected wildlife or plans for conceptual plan development and future environmental permitting. Field investigations shall occur in summer of 2018.

Data to be collected during field inspections at Stepping Stones Pond and Big Reed/Little Reed Pond shall include:
- GPS locations of all potential fish barriers. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Dimension and materials of each culvert or barrier including pertinent elevations. Topographic and hydraulic data required to adequately characterize each barrier. Measurement accuracy and procedures are presented in *Sections 1.9.2(ii) and 2.2.2*;
- General observations with respect to high water marks, sediment composition, channel conditions and stability, frequency of tidal influence, etc.;
- GPS locations of tidal wetland boundary for planning and review by regulatory agencies;

- GPS locations of ecological community boundaries adjacent to observed fish barriers and locations of any significant ecological communities or habitats for significant plant or wildlife species located within potential access routes or work areas;
- Site photographs.

The project team shall also obtain, review, and utilize available GIS data from the Town of East Hampton, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions:

- High resolution orthoimagery,
- 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography, and
- Suffolk County real property records to access property ownership.

The project shall develop schematic design for removal of barriers to each observed fish passage at Stepping Stones Pond and Big Reed/Little Reed Ponds. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail to promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use and Nick Nelson of Inter-Fluve.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for the correction of each identified fish obstruction, reasoning for recommendations, expected obstacles and advantages, and the prioritization of fish barrier removal.

Final recommendations report prepared by Land Use and Inter-Fluve shall include:

- Site Map of Stepping Stones Pond and Big Reed/Little Reed Pond based on GPS data collected by project team and Site and GIS data available from NOAA, New York State, Suffolk County, and Town of East Hampton;
- Site topographic map based on LIDAR data;
- Characterization of ecological communities adjacent to potential fish barriers and target waterways based on Ecological Communities of New York State (Edinger et al, 2014). GPS locations of suitable habitat for any rare and protected wildlife, flora, or ecological communities listed by the New York Natural Heritage Program;
- Locations of fish barriers including culverts, shallow waterbody reaches, accumulated debris, and stands of emergent vegetation;
- Map of adjacent existing land uses and property ownership based on Suffolk County GIS data, etc.
- Site Photographs within each reach of the target waterbodies and photographs of each potential obstruction to fish passage;
- Potential site access routes and work staging areas;
- Existing infrastructure that may be impacted;
- Preliminary cost estimates for the design and construction of each fish passage project
- Environmental permitting requirements.

The final concept drawings prepared shall present:

- Overview aerial of entire project area noting the location of individual sites
- Close-up of each site showing existing and proposed conditions including infrastructure, access routes, potential remediation work areas, work limits, sensitive ecological resources, and property boundaries

iv. Main Road MH-2 Wetland Construction

Existing stormwater infrastructure and ecological conditions at the Main Road MH-2 wetland shall be evaluated by William Bowman, PhD of Land Use and Nick Nelson on Inter-Fluve. Field investigations shall be completed in summer of 2018.

Data to be collected during field investigations shall include:

- GPS locations of existing stormwater drainage infrastructure. GPS locations of freshwater wetland boundary for concept plan development and review by regulatory agencies. GPS locations of upland and wetland community boundaries in and adjacent to project area and characterization of plant species composition, including mapping stands of upland and wetland invasive plants to identify potential mitigation areas if sediment forebay cannot be located entirely within upland area adjacent to Route 24. Anticipated accuracy and GPS procedures are presented in *Sections 1.9.2(i) and 2.2.1*;
- Location, elevation, dimensions, materials, and condition of existing stormwater outfall. Topographic data required to prepare conceptual plan for recommended sediment forebay and overflow spillway to existing freshwater wetland. Measurement accuracy and procedures are presented in *Sections 1.9.2(ii) and 2.2.2*;
- Locations of existing utility infrastructure;
- GPS locations of suitable habitat for any rare and protected wildlife and flora listed by the New York State Natural Heritage Program as known to occur in the immediate vicinity of Iron Point marsh or observations of rare and protected wildlife and flora.
- Site photographs.

Our team shall also review and analyze available data including GIS data from the Peconic Estuary Program, Town of Riverhead, Suffolk County, and New York State GIS Clearinghouse to evaluate existing conditions at the MH-2 site including:

- High resolution orthoimagery;
- LIDAR or digital elevation model data to assess general site topography, and;
- Suffolk County real property records to access property ownership.

The project shall develop a schematic design identifying the potential location(s) of the recommended sediment forebay and stormwater wetland, existing infrastructure, freshwater wetland boundary, and ecological community boundaries. In an effort to convey details in an efficient manner, schematic designs will likely be drawn on existing aerial photographs with sufficient detail (e.g. 0.5 ft resolution orthoimagery available from NYS GIS Clearinghouse) to promote discussion with and solicit feedback from project stakeholders and thoroughly demonstrate the approach to habitat restoration at the project site, but not the finished, presentation quality of the final concept drawings. Preparation of schematic designs shall be coordinated by William Bowman of Land Use and Nick Nelson of InterFluve.

Based on the environmental data and field observations resulting from research and analysis phase of the project and feedback from project stakeholders on schematic designs, the project team shall develop final recommendations for the stormwater wetland and sediment forebay construction, reasoning for recommendations, and expected obstacles and advantages.

The final recommendations report shall include:

- Site Map of the Main Road MH-2 wetland and surrounding uplands based on GPS data collected by Project Team and GIS data available from NOAA, New York State, Suffolk County, and Town of Riverhead;
- Site topographic map based on LIDAR data;
- Ecological communities map based on field delineation of community boundaries. GPS locations of suitable habitat or documented observations of any rare and protected wildlife, flora, or ecological communities listed by the New York Natural Heritage Program;
- Location of existing stormwater drainage structures, utility(s), and road infrastructure;
- Pertinent elevation data from field data collection;
- Potential location(s) and sizing for the recommended sediment forebay and stormwater wetland;
- Potential locations of mitigation areas to compensate for unavoidable wetland impacts due to construction.
- Preliminary cost estimates for design and construction;
- Construction access routes and staging areas;
- Environmental permitting requirements;
- Site Photographs.

The final concept drawings prepared by the project team shall:

- Meet the design standards contained in the 2015 New York State Stormwater Management Design Manual (NYSDEC, January 2015).
- Provide an overview aerial of entire project area;
- Identify existing and proposed conditions including infrastructure, forebay maintenance routes, freshwater wetland boundary, potential mitigation areas to compensate for wetland disturbance, limits of clearing and ground disturbance, and property boundaries;
- Identify permanent access area/route to allow for annual removal of accumulated sediments within forebay;
- Identify typical details and specifications of the proposed recommendations.

1.5.3 Task Five - Meetings

Land Use shall coordinate and schedule three meetings with the County and pertinent stakeholders:

- Kick-off meeting (April 19, 2018): To share the project team's technical approach with the County and pertinent stakeholders and obtain project-specific information.
- Interim Progress Meeting (on or about November 15, 2018): To present results of research and analysis of existing conditions and present schematic designs to the County and pertinent stakeholders.
- Wrap-Up Meeting (on or about March 1, 2019): To present the final report on

recommendations and conceptual design plans.

- Land Use shall schedule and attend any informal meetings with local stakeholders necessary to attain feedback for the development of conceptual designs and to maintain progress on accomplishing required tasks. These informal meetings will be scheduled *ad hoc* and only if it is determined by the contractor that a meeting is necessary to the effective progress and completion of the required tasks. For example, it may be necessary to meet with a stakeholder group, such as one of the Town agencies, to obtain and discuss previously collected data or information. It is not possible or necessary to determine a minimum number of informal meetings for the project and to predict when it might be necessary to schedule these informal meetings.

1.5.4 Task Six – Report Submission

A written draft Final Report shall be delivered to the County and Peconic Estuary Program (PEP) at least two weeks prior to the Final Wrap-Up meeting where the Final Presentation of our findings, recommendations, and conceptual plans will be delivered to the County and stakeholders. The Final Report shall contain all relevant written materials, field data, maps, schematic plans, and conceptual plans developed during the completion of Tasks 2-4 and shall contain an executive summary. The draft Final Report will be amended based on comments received from the County and pertinent stakeholders. Written comments may be submitted to Land Use, or verbal comments may be given after the Final Presentation. After amendment of the draft report, the final Final Report shall be submitted to the County, PEP Office, and US EPA Region 2. Ten (10) hard color copies shall be provided and five (5) CDs containing a PDF of the Final Report and all associated data, files, maps, plans, etc. All graphics shall be suitable for posting to Suffolk County or PEP's websites.

1.6 PROJECT SCHEDULE

The timeline for completion of the contract tasks for the Peconic Estuary Conceptual Habitat Restoration Design Planning Services project is presented in Table 2.

Table 2: Project Timeline

Task	*Expected Commencement and Completion Dates for Project Tasks*	*Expected # of Weeks Required for Task Completion*
QAPP Approval Procurement (Task 1)	April-July 2018	16 Weeks
Kick-off Meeting (Task 5)	April 19, 2018	2 Weeks
Research and Site Analysis (Task 2)	July-September 2018	6 Weeks
Visioning and Schematic Design (Task 3)	October-November 2018	6 Weeks
Interim Progress Meeting (Task 5)	November 15, 2018	2 Weeks

Recommendations and Conceptual Restoration Plans (Task 4)	November 2018- February 2019	6 Weeks
Presentation of *Draft Final Report* at Final Wrap-up Meeting (Task 5)	March 1, 2019	2 Weeks
Submission of *Final Report* (Task 6)	April 1, 2019	4 Weeks
Total	April 1, 2019	

1.7 BUDGET CONSTRAINTS

The total budget for the project is $99,980.00 provided through a contract with Suffolk County Department of Health Services. The budget is based on a reasonable number of person hours required to meet all of the project objectives, with technical and scientific experts.

1.8 GEOGRAPHIC LOCATION AND STUDY AREAS

The study area for this project includes the following locations (Appendix A):

a. Narrow River (Orient, NY) between tidal reaches of Narrow River and Whitcom Marsh including Broad Meadows March. This length of this reach of Narrow River is approximately 0.5 miles.

b. Iron Point (Flanders, NY) including the approximately 17.5 acre tidal marsh tributary to the mouth of the Peconic River between Woodroad Trail and Point Road. The study area for the Iron Point project consists of the area contained within a polygon defined by the latitude/longitude positions provided in Table 4 of *Section 2.1.1 (Environmental and Site Conditions)* .

c. Lake Montauk (Montauk, NY) including the culvert and ditch conveying water from Stepping Stones Pond to Lake Montauk and the waterway between Lake Montauk, extending through Little Reed Pond, to the open waters of Big Reed Pond culvert. The length of these waterways is approximately 200 feet and 0.9 miles for Stepping Stones Pond and Big Reed Pond/Little Reed Pond, respectively.

d. Main Road MH-2 (Aquebogue, NY) including the 2.61 acre Town of Riverhead-owned property at 705 Main Road in Aquebogue (SCTM#: 600-67-2-27) and the reach of Main Road (and its right-of-way) located immediately north of the subject property.

1.9 QUALITY OBJECTIVES & CRITERIA FOR PRIMARY & SECONDARY DATA

1.9.1 Objectives and Project Decisions

The main objective of this project is to analyze existing conditions, assess the feasibility of obtaining ecological restoration objectives, and prepare conceptual designs for four habitat restoration projects within the Peconic Estuary before implementation funding is sought.

The field research and environmental data collection that shall be used to develop the conceptual restoration plans are described in detail for each of the four sites in *Section 1.5.2 (Tasks Two through Four).* The findings of the field research and environmental data collection that shall be presented to PEP will include: narrative descriptions of existing site conditions, existing and

created maps and diagrams for analysis by the PEP and project stakeholders, and photos of the existing site and conditions. The contractor team shall establish a framework of recommendations and develop schematic designs for the potential changes (i.e. restoration actions) to each site. The final recommendations and conceptual restoration plan for each site will provide narrative text and illustrative drawings depicting what the implemented restoration action might look like. Each site narrative shall include necessary implementation information such as: restoration actions to be taken, estimates of materials needed, implementation objectives, phasing plans, required permits, and preliminary cost estimates.

The project does not involve the production of bid documents and construction drawings and specifications. Accordingly, accuracy standards for the conceptual design plans are not expected to be as rigorous as those needed for final bid documents and engineered site plans and specifications. At this conceptual design phase, it is most important to ensure that the most ecologically appropriate, technically feasible, and cost-effective restoration strategy is selected.

The conceptual designs must be of sufficient accuracy to allow for the final engineering designs and cost estimation phases of implementation funding to commence. The adequacy of the conceptual designs for these purposes is directly dependent on the quality and accuracy of the environmental data collected.

The anticipated accuracy of each aspect of environmental data collection is described in *Sections 1.9.2 (Data Acceptance Criteria), 2.1 (Sampling Design),* and *2.2 (Sampling Methodolgy).* For example, the anticipated accuracy of the GPS data collection is expected to be ±0.5m. This GPS accuracy and the anticipated accuracy of other environmental data collection are adequate for the development of conceptual design plans, as described below. *Sections 2.2 (Sampling Methodology), 2.5 (Quality Control)* and *4.2 (Verification and Validation Methods)* describe the quality assurance goals and procedures that will be implemented to ensure that anticipated accuracy standards are met. Implementation of these procedures shall ensure that the conceptual designs based on the collected environmental data will be sufficient to allow for engineering design and cost estimate phases to commence.

1.9.2 Primary Data Acceptance Criteria

Field data will be collected and examined in terms of the following numerical data quality indicators and guidelines to ensure that all data generated during field surveys are of appropriate quality to fulfill the project goals described above. These data quality indicators include the following:

- **Precision** is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions; calculated as either the range or as the standard deviation. It may also be expressed as a percentage of the mean of the measurements, such as relative range or relative standard deviation (coefficient of variation).
- **Bias** is the systematic or persistent distortion of a measurement process that causes errors in one direction.
- **Accuracy** is measure of the overall agreement of a measurement to a known value; it includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations.
- **Representativeness** is the degree to which data accurately and precisely represent

a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

- **Comparability** is a qualitative term that expresses the measure of confidence that one dataset can be compared to another and can be combined for the decision(s) to be made.
- **Completeness** is a measure of the amount of valid data needed to be obtained from a measurement system.
- **Sensitivity** is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest.

Section 2.2.1 (Sampling Design) and *2.2.2 (Sampling Methods)* shall describe guidelines and field protocols for ensuring that these criteria are met. *Section 2.5 (Quality Control)* shall determine procedures for verifying that these criteria are met. Please note that the sensitivity data quality indicator is not relevant to the field work and primary data collection component of the QAPP.

i. GPS Data

Geographic position data shall be collected for all four projects. All GIS data produced for the five projects will adhere to the requirements of EPA's National Geospatial Data Policy (NGDP) (United States EPA, 2008). Geographic position data will be collected for the location of potential fish passage barriers; culverts, outfalls, or stormwater drainage infrastructure; boundaries of ecological communities or other important ecological features such as tidal or freshwater wetland features, boundaries of invasive plant stands/infestations, marsh ditches or channels, or top/bottom of slopes, berms, or banks; hazardous fuel accumulations; locations of utilities or other infrastructure; and potential site access/egress paths.

Precision - GPS data shall be collected with a Trimble GeoXH 6000 Series field receiver. The typical accuracy of this instrument is ± 0.5 m with post-processing. The adequacy of the accuracy of the GPS receiver for the four projects must be considered in relation to 1) the project objectives and 2) other sources of error in introduced by geographic transformation of data (less than 0.5m) and rectified aerial imagery (approximately 1m, overall accuracy and 1.5m maximum error). The conceptual restoration plans for all four projects will contain at least one plan sheet in which geographic position data is overlaid on digital aerial imagery for the project sites. Therefore, considering the precision of the GPS receiver and other error sources associated with geographic data transformation and overlaying GPS points on a rectified aerial image, the estimated maximum error of the GPS data points shall be ±2.0m. Conceptual plan sheets in which GPS positions are not overlaid on digital aerial imagery would have lower maximum error of ± 1.0m. In either case, an estimated precision of ±1.0-2.0m would be sufficient for the development of conceptual ecological restoration plans. It is estimated that a maximum error of ± 3.3m is sufficient for the preparation of these conceptual restoration plans. Final construction drawing and specifications for any of the projects would require greater precision. These final construction drawings and specifications are not a part of this project.

Bias – There are no potential sources of directional bias in the collection of geographic position data for any of the four sub-projects.

Accuracy- Considering that there are no potential sources of directional bias in the collection of geographic position data, the estimated accuracy of the geographic position data corresponds to the estimated precision of the GPS receiver described above. Accordingly, the estimated accuracy for the geographic position data is ± 1.5-2.5m and is sufficient for the development of conceptual habitat restoration plans, as described above.

Representativeness and Completeness – The collected geographic position data for all four projects shall have no deficiencies regarding representativeness or completeness. Geographic position data shall be collected for all pertinent features, described previously, within the project areas (the limits of the project areas are described in *Section 1.8*). Accordingly, the geographic position data shall be representative and complete.

Comparability - GPS data shall be collected using the World Geodetic System 1984 (WGS84), the primary map datum utilized by the Global Positioning System. Position data shall be post-processed and exported to GIS point files using ESRI (ArcGIS) GPS Analyst Extension software and compiled within the project field-data collection database. The positional data shall be transformed to Long Island State Plane Coordinate System and NAD83 datum for mapping overlay with other spatial data sets. The use of the WGS84 and NAD83 shall ensure comparability with existing and future geospatial data sets.

ii. Environmental and Site Conditions Data

Environmental and site data that may be collected for these projects would include simple in-field measurements of the dimensions of potential barriers to fish passage; culverts; outfalls; stormwater infrastructure; and wetland features such as dimensions of marsh ditches or channels, shallow stream reaches, berms, banks, height of vegetation, or depth of accumulated thatch. Environmental and site data shall be sufficiently accurate if field identification and recording of these features is correct a minimum of 99% of the time. The geographic position of these features shall be recorded with a handheld GPS receiver as discussed in *Sections 1.9.2.i and 2.1.2*. Measurements of the basic dimensions of these features shall typically be made with either a 25 ft tape measure (with 0.125 inch increments) or a graduated soundings pole (with 0.1 foot increments). These measurements may include the following: stream width above and below the potential fish barrier or culvert, stream water depth above and below the potential fish barrier or culvert, culvert dimensions, stream/channel width or depth, relative vertical distance (e.g. vertical distance between the upstream and downstream ends of a culvert), and water velocity. The estimated accuracy of these basic environmental and dimension measurements, described below, is sufficient for the development of conceptual habitat restoration plans.

Precision – The simple dimension measurements described above shall be made in the field with either a 25' tape measure (with 0.125 inch increments) or a graduated soundings pole (with 0.1 foot increments). The anticipated accuracy of these measurement tools are ± 0.12 inch and ± 0.1 foot, respectively. Relative vertical distance will be measured using a TopCon RL-H4C laser level or Nikon Total Station (Model #DTM-A5LG). The anticipated accuracy of these vertical measurements associated with the TopCon laser level, when measurements are within 100 feet of level, is ± 0.06 inches. The vertical precision of the Nikon DTM-A5LG is dictated by the accuracy of the instruments measurement of the vertical angle above or below horizontal. The

DTM-A5LG's precision for measurement of vertical angle is ± 0.0003 degrees or ± 2 seconds. At a distance of 100 ft between the total station instrument and the prism pole, this vertical angle precision results in an expected precision for elevation measurements of ± 0.02 inches. This anticipated accuracy is adequate for the development of conceptual restoration plans. The velocity upstream and downstream of any potential fish passage barrier may be measured with a Marsh McBirney Flow-Mate 2000. The measurement range of the flow meter is -0.5 to +20 ft/sec with an accuracy of ±2% of measurement reading. This anticipated accuracy is adequate for the development of conceptual restoration plans.

Bias – There are no potential sources of directional bias in the collection of the tape measure and sounding pole dimension measurements. There is a potential source of bias in the relative vertical distance measurements conducted with the Nikon Total Station as the error in vertical angle measurement will be amplified with increasing horizontal distance between the total station instrument and the prism pole. The vertical elevation error of ±0.02 inches presented above is the maximum expected error based upon 100 feet between the total station and prism pole. There is a bias in the water velocity measurements as the estimated error in precision is a constant fraction of the measurement velocity. Accordingly, the absolute error shall be greater for fast-moving water than for slow-moving waters. This bias is inconsequential for the project as the project's waterways (Stepping Stone Pond, Little Reed Pond, and Big Reed Pond outflows) have low flow velocities and flow velocity is not likely to act as a barrier to fish passage in these waterways.

Accuracy- Considering that there are no potential sources of significant directional bias in these dimensional measurements, the estimated accuracy of the dimensional measurements corresponds to the estimated precision described above.

Representativeness and Completeness – Basic environmental and dimensional data shall be collected for all pertinent features, described previously, within the project areas (the limits of the project areas are described in Section 1.8). Accordingly, the geographic position data shall be representative and complete.

Comparability – This basic dimensional data shall be recorded in standard units and shall be comparable with existing or future data. In addition, the date and time of the measurements will be recorded to facilitate comparisons with other data.

iii. Sediment Sampling and Contaminant Analysis for Iron Point

As described in *Section 1.5.2(ii*), new marsh channels may be excavated to increase tidal exchange in Iron Point marsh. Measurements of the concentrations of various contaminants in the marsh sediments is necessary to 1) determine if the sediments removed to create new marsh channels are contaminated (as defined by NYSDEC standards) and if the excavated sediments can be re-used on site or if off-site/landfill disposal would be necessary and 2) if the sediments exposed by creation of a new marsh channel would provide suitable habitat for benthic aquatic organisms.

The contaminant concentrations of the existing marsh sediments will be assessed by collection of

two (2) sediment borings in areas recommended for potential new marsh channels. Sediment borings will be up to five (5) feet in length to characterize the potential channel excavation profile. The two (2) sediment samples will be analyzed for all contaminants identified in NYSDEC TOGS 5.1.9 Table 2 and Table 375-6.8(b) of 6 NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives) (provided in Appendix C) and summarized in Table 3. The sediment samples will be analyzed by a New York State-accredited laboratory (Long Island Analytical Laboratories; Holtsville, NY) using the standard laboratory analytical methods outlined in Table 3.

Precision –
Method precision is dependent upon sampling technique and analytical method. Quantifying the precision of the sampling and analytical methods for the Iron Point sediment sampling would require collection and analysis of both field duplicate and laboratory duplicate samples. Collection of field duplicate samples and analysis of laboratory duplicate samples is not necessary nor feasible for this project due to the limited budget available for this project (and the multiple objectives and multiple project sites), the concept- or feasibility-level assessment objectives for the project, the limited number of sediment samples that will be analyzed (i.e. two samples), and the absence of a final design deliverable as part of this project.

As described below, field sampling will be as consistent as possible and will incorporate steps to avoid cross-contamination of field samples. The laboratory analysis will be completed by a New York State accredited laboratory following USEPA standard methods listed in Table 3 and following appropriate QA/QC methods.

This project aims to provide an initial, concept-level assessment of the potential contaminant concentrations in the site sediments to broadly inform constraints on sediment re-use and disposal. Additional sediment sampling and analysis will be required upon completion of the final construction design and determination of the final excavation locations and proposed cut depths. In addition, the NYSDEC will require additional sediment sampling to support the issuance of regulatory permits.

Bias – There are only limited potential sources of directional bias in the collection of the sediment samples. Failure to property clean or de-contaminate sampling equipment could bias a given sediment sample in the direction of the previous sediment sample. Methods to eliminate cross-contamination are described below in *Section 2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point).*

Accuracy-
The sediment samples will be analyzed for grain size analysis, total organic carbon content, and all analytical parameters required by the NYSDEC for evaluation of dredging or excavation in tidal wetlands including those parameters identified in Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives) (provided in Appendix A). Accuracy criteria for this sediment sampling and laboratory analyses will be the minimum standard for each analytical parameter in Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives). The analytical laboratory shall be informed of the

necessity to test to these NYSDEC regulatory standards in the submit Chain of Custody documentation submitted to the laboratory.

Table 3: Approximate Minimum Detection Limits for USEPA Methods based on previous analytical reports obtained from Long Island Analytical Laboratory (Holtsville, NY)

Contaminants	USEPA SW-846 Method	Approximate Minimum Detection Limit
Pesticides (Including Mirex)	8081A	0.5 µg/Kg
Herbicides (Including Silvex)	8151	10.0 µg/Kg
Total Aroclors of PCB's	8082	10.0 µg/Kg
Volatile Organics (VOC's)	8260B	0.5 µg/Kg
Semi-VolatileOrganics (SVOC's)	8270C	50.0 µg/Kg
Metals	6010B	0.5 mg/Kg
Hexavalent Chromium	7196A	0.5 mg/Kg
Cyanide	9012A	0.5 mg/Kg
Sieve Analysis	D422	N/A
Total Organic Carbon (TOC)	9060A	100 mg/Kg

Sampling methods to minimize potential for reduced accuracy are described in Section 2.2.3 *(Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point)* including decontamination procedures between sampling, thorough homogenization of sediment samples (except for VOC analysis), and proper storage and transport of samples at or below 4°C.

Another potential source of poor accuracy pertinent to this project is matrix interference occurring due to the complex composition of estuarine sediments, when the sample contains a contains a constituent that either produces a signal indistinguishable from a target analyte or attenuates the target signal. The analytical laboratory shall report when/if reduced accuracy occurs due to matrix interference by adding a "Data Qualifier" flag on the analytical reports for the pertinent analyte(s).

The analytical laboratory shall follow all procedures associated with the Standard Methods identified on Table 3. The laboratory shall utilize internal standards and surrogate QC samples to measure the accuracy for project samples and shall include the results from these surrogate and internal standards on the analytical reports for the sediment sampling completed for this project.

Representativeness and Completeness– As stated previously, additional sediment sampling and analysis will be needed to develop final construction plans and obtain environmental permits from regulatory agencies. Accordingly, the proposed sediment sampling will not be complete. However, the sampling will be adequate to 1) assess the feasibility of on-site re-use of sediments versus off-site/landfill disposal and suitability of sediments as habitat for benthic aquatic organisms and 2) provide guidance to Peconic Estuary Program, the municipal landowner, and project partners regarding the number and location of additional sediment sampling that will be needed during the development of construction plans and environmental permit applications.

The project study area consists of an approximately 17.5 acre tidal marsh. The selected locations of sediment borings and sediment sample collection will be chosen to be representative of the

marsh sediments that would need to be excavated to construct additional marsh channels to increase tidal flushing. Selected sediment sampling locations shall be within the excavation footprint(s) of the conceptual location of proposed marsh channel. A visual assessment of the environmental and physical characteristics of the excavation footprint(s) shall be used to determine sediment sampling locations that are representative of the larger footprint(s). Environmental and physical characteristics that shall be qualitatively evaluated to select representative sampling locations include soil and organic matter texture at the substrate surface and within 12 inches of the substrate surface, elevation and geomorphic position (i.e. panne or pond, vegetated tidal wetland with native plant community, *Phragmites* marsh, upland, or earthen berm), depositional setting, and presence or thickness of accumulated thatch. As described in *Section 2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point)*, sediments collected from the proposed dredge layer will be thoroughly homogenized (with exception of samples for VOC analysis) to ensure that sample collected for laboratory analysis is representative of sediment layer.

Comparability – The sediment sampling methods and table with standard analytical methods used for this project, and analytical results will be attached as an Appendix to the final report for the conceptual design plan for the Iron Point wetland restoration to allow those involved in any subsequent design and planning phases to replicate sediment sampling and analytical methods.

The proposed sediment sampling methods will homogenize sediments between the existing substrate surface and the proposed excavation/cut depth based on conceptual plans of proposed new marsh channels to increase comparability to the results of future sediment sampling and analysis that will be needed for final design and permitting. The laboratory analytical results are presented in mg/Kg for metals, hexavalent chromium, and cyanide and µg/Kg for all other analytical parameters (except sieve analysis/grain size and total organic carbon content). The pertinent NYSDEC standards for evaluation of dredging or excavation in tidal wetlands, i.e. Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives), are presented in ppm (equivalent to mg/Kg). Accordingly, all data summaries created from the laboratory analytical reports included in the deliverables produced for this project shall present data in ppm (i.e. mg/Kg) to increase comparability with NYSDEC standards.

iv. Secondary Data Acceptance Criteria

Secondary data used in this project includes the 2014 USGS Long Island, New York Sandy Lidar Digital Elevation Model IMG data to access site topography at the Narrow River and Iron Point sites from the National Oceanic and Atmospheric Administration. The average vertical accuracy of the digital elevation model obtained from 2014 USGS Long Island New York Sandy Lidar is $\pm$ 0.86 inches vertically (USGS, 2014). The accuracy of the digital orthoimagery is $\pm$ 8 ft horizontally at the 95% confidence level. The accuracy of this GIS data from USGS is adequate for inclusion in this conceptual planning project.

It is anticipated that secondary data for a wide variety of sources shall be necessary for the completion of this project. However, at this time, secondary data that shall be used has not been identified. Due to the diversity of secondary data that shall be needed, uniform *a priori*

standards for evaluation of the acceptability of the accuracy of this data are not possible. However, the following guidelines shall be implemented to 1) evaluate the accuracy of secondary data, 2) determine if the accuracy of the secondary data is consistent with the accuracy standards for the primary data and suitable for the development of conceptual design plans, and 3) provide a record of the secondary data evaluation process. The following questions shall be answered for each secondary data source:

Who is the source of the secondary data? Is this source reliable and knowledgeable?
Did the source publish the accuracy of the data? If so, what is the expected accuracy?
Did the source publish or document the methods for the study? Was a standard or reliable method used?

The answers to the above questions shall be entered into a tabular database along with the type of data and collection dates; originating organization; and report title, author and date. Based on the answers to the above questions, a determination on the acceptability of the secondary data shall be made by the Project Manager. This evaluation and determination shall be reviewed and approved by the QA/QC Manager. The tabular database and scanned copies of the secondary data utilized for the project shall be included as an appendix of the Final Report. Hard copies of the tabular database and scanned copies of the secondary data shall be kept in the project-specific by Land Use Ecological Services until September 30, 2021 (two years after expiration of the project contract).

1.10 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Not Applicable for most of the data collection and environmental sampling, as no Special Training or Certifications are necessary for most of the environmental sampling included in this project. William Bowman has completed five on-line tutorials offered by Trimble (Sunnyvale, CA) related to operation of the Trimble GeoXH handheld GPS receiver. Kelly Risotto has completed a Graduate Certificate in Geographic Information Systems from the University of West Florida (August 2011).

Sediment analytical tests shall be completed by Long Island Analytical Laboratories (Holbrook, NY). Long Island Analytical Laboratory is a fully accredited laboratory (NYS Lab ID # 11693; USEPA ID# NY01273) certified to test solid and hazardous waste, potable and non-potable water, and air emissions in New York State.

1.11 DOCUMENTS AND RECORDS

The following project-related materials will be kept by Land Use Ecological Services until at least September 30, 2021.

- **Field Data Sheets and Notes –** will be made available to Suffolk County or the EPA representatives on the QAPP distribution list during the project period upon request.
- **Quality Assurance Project Plan** (QAPP) – describing project background, methodology, and quality assurances measures to be implemented to meet project objectives.
- **Meeting Minutes** –Minutes shall be recorded for Project Meetings and shall be circulated to

Suffolk County and the EPA Project Officer.

- **Interim Presentation on Existing Conditions and Schematic Design-** All presentation materials and supporting materials prepared for the Interim Progress Meeting.
- **Final Report on Recommendations and Conceptual Plans-** The final report and conceptual plans and all presentation material and supporting materials utilized for the Final Wrap-Up meeting.

1.12 QA PROJECT PLAN DISTRIBUTION

The most current approved Quality Assurance Project Plan (QAPP) will be distributed to all project staff listed in the Distribution List (Section 1.2). In the event that revisions or updates become necessary, a revised QAPP will be submitted to EPA for approval before additional work is begun. If additional individuals become involved in project planning and implementation, the Distribution List will be updated and the approved Quality Assurance Project Plan (QAPP) will be distributed to these individuals as well.

The most current approved QAPP will be distributed in digital format vie email, using email addresses listed in the distribution list. The Project Manager will be responsible for emailing the QAPP and making sure that all of the individuals on the distribution list have received it, and will take the lead on distributing any revisions or updates to the QAPP that may be introduced after the initial approval.

2.0 DATA GENERATION, ACQUISITION, AND ANALYSIS

Environmental data collected for this project includes geographic position data (for all four projects), basic dimensional measurements of culverts, outfall structures, and ecological features (for all four projects), and sediment sampling and laboratory analysis for the Iron Point project. This section of the QAPP explains the quality assurance procedures to be applied during the field data collection portions of the project Task 2 (*Research and Analysis*).

2.1 SAMPLING PROCESS DESIGN

2.1.1 Environmental and Site Conditions

Sites where environmental data will be collected for these four projects will be based on the location of potential barriers to fish passage (such as culverts), in-water structures that could affect hydrological processes (such as culverts and outfalls); stormwater infrastructure; and pertinent ecological features such as marsh ditches or channels, ecological community boundaries, shallow stream reaches, berms, stream/channel banks, invasive plant infestations, and accumulations of hazardous fuels. The geographic position of these features shall be recorded with a handheld GPS receiver as discussed in *Section 1.9.2.i* and *2.2.1*.

Measurements of the basic dimensions or attributes of these features shall typically be made with either a 25 ft tape measure (with 0.125 inch increments) or graduated soundings pole (with 0.1 foot increments); relative vertical distance will be measured using a TopCon RL-H4C laser level or Nikon Total Station (Model #DTM-A5LG); water velocity upstream and downstream of any

potential fish passage barrier would be measured with a Marsh McBirney Flow-Mate 2000.

Pertinent environmental and site features requiring collection of data will be based on the judgment of the primary field personnel, William Bowman, PhD of Land Use Ecological Services, Nick Nelson of Inter-Fluve, and James Remuzzi of Sustainable Solutions. Dr. Bowman has more than twenty years of experience working primarily as a wetland and terrestrial ecologist in the New York area. His areas of expertise include tidal and freshwater wetland ecology, plant physiological ecology, forest ecology, and invasive plant management. Mr. Nelson has ten years of experience in fluvial geomorphology and hydrology and works on all phases of river restoration and dam removal projects in New England and throughout the country. Mr. Remuzzi has 15 years of experience in project management, field data collection, and planning for prescribed fire and other land management projects. His clients include private landowners, non-profits, and government agencies, such as National Park Services and NRCS.

The study area for each of these projects corresponds to the study areas put forth in the Suffolk County RFP 16019 and Addendum #3 and discussed at the Project Kick-off Meeting on April 19, 2018. The study area for the Narrow River project (Southold, NY) shall consist of the area between an earthen dam and double culvert located to the east of Narrow River Road, the entirety of Broad Meadows Marsh (located between the earthen dam and Route 25), the culvert under Route 25, adjacent farmlands and adjacent reaches of Narrow River Road and Route 25, and Whitcom Park (the Town of Southold-owned property located north of Route 25). The study area for the Iron Point project (Southampton, NY) shall consist of the 17.5 acre tidal marsh and adjacent uplands contained within a polygon defined by the following four latitude/longitude positions.

Table 4: Study Area Limits for the Iron Point (Southampton, NY) Project

Boundary Point	**Latitude**	**Longitude**
ID# and Cardinal Direction	*Degrees/Minutes/Seconds*	*Degrees/Minutes/Seconds*
1-NW	40° 55’ 07.63” N	72° 37’ 37.45” W
2-NE	40° 55’ 09.23” N	72° 37’ 14.54” W
3-SE	40° 55’ 03.06” N	72° 37’ 14.77” W
4-SW	40° 54’ 59.72” N	72° 37’ 25.62” W

The study area for the Lake Montauk project consists of 1) the culvert conveying water from Stepping Stones Pond to Lake Montauk under Old West Lake Drive and an area 50-ft on either side of the conveyance ditch and 2) the culvert conveying water from Little Reed Pond to Lake Montauk under East Lake Drive, the marsh and tidal stream located downstream of the East lake Road culvert, the culvert conveying water out of Big Reed Pond, the existing ditch within the ~8 acre *Phragmites* marsh separating the Big Reed Pond culvert from the open waters associated with Little Reed Pond, the existing ~450-ft ditch between the Big Reed Pond culvert and open waters of Big Reed Pond, and Big Reed Pond.

The study area for the Main Road, MH-2 Wetland project (Riverhead, NY) includes the 2.61 acre Town of Riverhead-owner property at 705 Main Road in Aquebogue (SCTM#: 600-67-2-

27) and the reach of Main Road (and its right-of-way) located immediately north of the subject property.

The environmental data for these projects shall be collected between July and September 2018. All necessary environmental data can be adequately collected during this time period.

2.1.2: Sediment Sampling and Contaminant Analysis for Iron Point

As described in *Section 1.5.2(ii*) *(Iron Point Wetland Restoration)*, two (2) sediment borings will be collected and analyzed for sediment contaminant concentrations to 1) assess the feasibility of on-site re-use of excavated sediments or off-site/landfill disposal and 2) provide a concept plan-level analysis of the suitability of sediments exposed by creation of a new marsh channel as habitat for benthic aquatic organisms. Additional sediment sampling and analysis will be needed to develop final construction plans and obtain environmental permits from regulatory agencies.

The sediment borings collected will be within the tidal marsh within the Study Area defined in *Section 2.1.1 (Environmental and Site Conditions)*. At this time, the sediment sampling locations are not known. Sediment sampling locations will correspond to locations recommended for potential new marsh channels and boring depth will correspond to proposed excavation/cut depths identified on prepared conceptual plans to increase comparability of these results to the results of future sediment sampling and analysis that will be needed for final design and permitting. PEP and project stakeholder review and comment on the Schematic Design for this project will be incorporated into sediment sampling locations. Accordingly, the sediment sampling will be conducted after the Interim Progress Meeting and between November 15, 2018 and January 15, 2019. There are no seasonal constraints associated with sediment sampling and analysis; therefore, all proposed sediment sampling can be adequately performed during this time period.

2.2 SAMPLING METHODS

2.2.1 Collection of GPS Data

All GIS data collected will adhere to the requirements of EPA's National Geospatial Data Policy (NGDP) (United States EPA, 2008). GPS data will be collected using a Trimble GeoXH 6000 Series receiver and post-processed to attain the expected ± 0.5-1.0 m accuracy. Field receiver shall be logged and recorded in the field using TerraSync 5.0 software. Field GPS data shall be collected by William Bowman, PhD. The following data acquisition standards and methods shall be utilized to attain the expected GPS receiver accuracy.

Control Configurations - Following the manufacturer's recommendations, GPS receiver shall be set to operate using the *Smart Settings* option for GNSS or the following custom GNSS settings:

- Use Integrated SBAS (satellite based augmentation system) for real-time data correction.
- Use Real-Time corrected GNSS with a Real-Time Data Age Limit of 1 minute.
- Data shall be collected for 0.33-1.0 minutes at 1-2 second intervals to obtain a

minimum of 10-20 data points per data point.

- Only PDOP (Dilution of Precision) values between less than or equal to 6 shall be used. PDOP values greater than 6 may result in measurement inaccuracy of 1m or more.
- Only HDOP (Horizontal Dilution of Precision) values less than or equal to 4 shall be used.
- Only satellite signals with a SNR (Signal to Noise Ratio) of greater than 6 shall be used for data.
- Only satellites positioned more than 15º above the horizon shall be used. This angle shall minimize signal shadow from topography, trees, and buildings.
- Data shall not be collected if less than five satellites are visible to the GPS receiver.

Satellite Obstruction Due to Building or Tree Shading **-** GPS receiver operator shall hold receiver at arm's length away from the body (to avoid satellite signal shading) and at a height of 1.2 m above the ground or a Trimble Tornado antenna shall be used. Correct antennae elevation settings shall be checked daily prior to use of GPS receiver. Operator shall stand to the north of the GPS receiver to prevent obstruction of satellites located in the southern sky and vice versa.

Control or Reference Points- At least three control or reference points shall be collected during each full day of field data collection (including at the beginning and end of the day) by obtaining a GPS position at a known location or feature.

Battery Maintenance **-** The Trimble GeoXH battery capacity permits 10 hours of operation on a single charge. Receiver battery shall be charged each night prior to scheduled field data collection activities. A back-up (and fully charged) battery shall be brought into the field for all GIS data collection.

2.2.2 Collection of Environmental and Dimensional Data

Environmental and site data collected for the Narrow River, Iron Point, Lake Montauk, and Main Road MH-2 projects could include simple in-field measurements of the dimensions of potential barriers to fish passage; culverts; outfalls; stormwater infrastructure; and wetland features such as dimensions of marsh ditches or channels, shallow stream reaches, berms, banks, height of vegetation, or depth of accumulated thatch. The geographic position of these features shall be recorded with a handheld GPS receiver as discussed in *Sections 1.9.2.i* and *2.1.2*. Measurements of the basic dimensions of these features shall typically be made with either a 25 ft tape measure (with 0.125 inch increments) or a graduated soundings pole (with 0.1 foot increments). These measurements may include the following: stream width above and below the potential fish barrier or culvert, stream water depth above and below the potential fish barrier or culvert, culvert dimensions, stream/channel width or depth, relative vertical distance (e.g. vertical distance between the upstream and downstream ends of a culvert), and water velocity. These measurements shall be conducted as follows:

Stream/Waterway Width- Stream width and stream channel width shall be measured above and below each potential barrier. In many cases, the stream is actually a man-made channel,

ditch, or other narrow waterway. The term "stream" is used for simplicity. Stream width and stream channel width shall be measured immediately adjacent to the potential barrier provided that this width is representative of the stream width found 25' upstream and downstream of the barrier. If the stream width varies by more than 25% in the 25' upstream and downstream of the barrier, then additional stream width measurements (and distance upstream and downstream of the barrier) shall be collected to account for this variability. This measurement shall be made with the 25' measurement tape. To measure stream channel width, the tape shall be held or staked at the bottom of the stream bank and then stretched across the stream to the bottom of the opposite stream bank. To measure stream width, the tape shall be held or staked at the water's edge and then stretched across the stream to the water's edge on the opposite side of the stream. Measurements shall be recorded to the nearest 0.25 inch.

Stream/Waterway Water Depth- Water depth shall be measured at the stream mid-point and halfway between the stream mid-point and the water's edge at each bank. Measurements shall be made with a graduated sounding pole. Measurements shall be recorded to the nearest 0.1 foot. It is acknowledged that in-stream water depth will vary considerably due to variation in groundwater elevation and precipitation. These water depth measurements collected during field inspections are not continuous or replicated; therefore, these measurements are not representative of the wide range of flow depths possible. Continuous or replicated measurements of water depth are not necessary for this project as 1) water depth is not being measured as a quantitative criteria for evaluating fish passage, as alewives can migrate upstream in streams with water as shallow as 1.2-4.2 inches in depth (Maine Department of Transportation, 2004) and 2) relative vertical distance measurements will also be collected.

Culvert or Outfall Dimensions- The width, height, and water depth within a culvert or stormwater outfall shall be measured with a 25' tape measure or graduated sounding pole both at the upstream and downstream ends of the culvert. Measurements shall be recorded to the nearest 0.125 inch or 0.1 foot depending on whether a tape measure or graduated sounding pole is utilized for the measurement. For cylindrical culverts, water depth shall be measured between the nadir of the culvert and the water level at the time of the field inspection. The water depth shall also be measured between the nadir of the culvert and any permanent water marks on the sides of the culvert, if water level is below these water marks during the time of field inspection.

Water Velocity- The water velocity upstream and downstream of each potential fish barrier shall be measured with a Marsh McBirney Flow-Mate 2000. The measurement range of the flow meter is -0.5 to +20 ft/sec with an accuracy of ±2% of measurement reading. For culverts, water velocity shall also be measured within the culvert. Water velocity shall be made in the deepest portion of the stream channel to record maximum velocity within the stream channel. Similar to water depth measurements, stream water velocity will vary considerably due to variation in groundwater elevation and precipitation. These water velocity measurements collected during field inspections are not continuous or replicated; therefore, these measurements are not representative of the wide range of flow conditions possible. Continuous or replicated measurements of water depth are not necessary for this project as high stream water velocity is not likely to be acting as a barrier to fish passage in the subject stream systems.

Relative Vertical Distance – Relative vertical distance will be measured in various settings for

this project including 1) quantifying the vertical distance between the upstream and downstream ends of a culvert, 2) developing a cross-section profile of an earthen berm or marsh channel or ditch, 3) developing cross-section profiles on natural or man-made slopes featuring transitions between wetland and upland communities, and 4) developing longitudinal section profiles of existing conditions from an outfall (i.e Main Road MH-2 site) or culvert (i.e. Stepping Stones Pond) to the downstream, receiving waterbody or wetland. Relative vertical distance will be measured using a TopCon RL-H4C laser level or Nikon Total Station (Model #DTM-A5LG). The anticipated accuracy of these vertical measurements associated with the TopCon laser level, when measurements are within 100 feet of the instrument, is ± 0.06 inches. The vertical precision of the Nikon DTM-A5LG is dictated by the accuracy of the instruments measurement of the vertical angle above or below horizontal. The DTM-A5LG's precision for measurement of vertical angle is ± 0.0003 degrees or ± 2 seconds. At a distance of 100 ft between the total station instrument and the prism pole, this vertical angle precision results in an expected precision for elevation measurements of ± 0.02 inches.

The laser level or total station shall be stationed at the upper (i.e. higher elevation) position and the graduated pole or rod stationed at the lower position. A graduated sounding pole or rod (with 0.1 foot increments) shall be used to measure the height of the total station or laser level above the ground surface and recorded to the nearest 0.1 foot. During measurements of relative vertical distance where the lower position features soft or unconsolidated sediments, care will be taken to place the graduated pole or rod gently on the sediment surface so that the lower end of the pole/rod is not pressed below the sediment surface. Similarly, if the lower position features accumulated plant biomass, duff, or thatch, the depth of this accumulated biomass will be recorded and gently removed. The lower end of the pole/rod will then be placed on the actual sediment surface.

The geographic position of both the upper and lower positions shall be recorded as necessarywith a handheld GPS receiver as discussed in Section 1.9.2.i and 2.1.2.

To ensure accurate measurements of vertical elevation the following procedures shall be utilized:

- The legs of the tripod used to support the instrument shall be pressed firmly into the ground to anchor the tripod securely prior to leveling of the instrument.
- The instrument shall be properly leveled using the instrument's optical plummet and bubble level. Air bubbles within the optical plummet and level shall be adequately within the reticle mark or level lines, respectively.
- The instrument battery shall be fully charged prior to commencement of field work.. The instrument battery allows for an operating time of approximately 4 hours. Accordingly, a spare charged battery shall be brought into the field to replace the initial battery.
- The distance between upper and lower positions (i.e. between laser level or total station and graduated rod/prism pole) shall be sufficiently small that the light intensity from the laser level or reflected from the prism is sufficient to collect accurate measurements.

2.2.3 Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point

Two sediment cores will be collected at locations corresponding to recommended locations for new marsh channels. The sediment cores shall be collected using a multi-stage sediment sampler or geoprobe operated from the sediment surface. A supply list for sediment sampling for the Iron Point project is provided in Appendix C. The cores shall extend twelve inches below the recommended excavation depth associated with the new marsh channel.

Each core will be logged for soil characteristics in the field using the United States Geological Survey (USGS) Unified Soil Classification system. Each sediment sample core will be inspected for visibly distinct layers. Only the sediments between the sediment surface and the proposed excavation depth will be sampled and analyzed for contaminant concentrations. This sample shall be referred to as Segment A (excavation sample).

After collection of each core and identification of Segment A (excavation sample), a grab sample will be collected from Segment A for each sampling location yielding two (2) samples for VOC analysis. The remaining Segment A material from each core shall be homogenized (or well-mixed within a plastic bucket) and composited into a single sample for laboratory analysis for the other parameters listed in Table 3. Sediment from the individual cores from different sampling locations will not be composited.

Sediment sampling equipment shall be decontaminated between collection of sediment samples using phosphate-free laboratory detergent, such as Liquinox by Alconox (Jersey City, NJ) or equivalent, with appropriate long-handled scrub brushes or bottle brushes, tap water, and plastic buckets. Decontamination shall be completed on a plastic sheet or tarp laid upon the ground surface. Water used for decontaminated sampling equipment shall not be dischargeD proximal to the subsequent sediment sampling location.

Sample containers will be supplied by the testing laboratory. The containers will be laboratory cleaned, pre-preserved and sealed with the appropriate documentation. All sample containers will be labeled using a permanent marker to indicate the date, time, sample location, and sample identification number. This information will also be recorded in a field log book and on a chain of custody form that will follow the samples. Once each sample container is filled, capped and labeled, it will be appropriately packaged to prevent breakage and placed in an ice-filled insulated cooler, maintained at a temperature of 4° C, until the samples are delivered to the laboratory within 24 hours of collection.

Sample numbering shall be formatted as follows:

Each sample segment will be given a sample test number according to the format **IP/C#/CS#**, where:
IP = Iron Point
C# = Core Number 1 or 2
CS = Core Segment: (A) material to be excavated

QUALITY ASSURANCE AND QUALITY CONTROL

Laboratory QA/QC procedures will be consistent with the requirements outlined in Appendix C of the NYSDEC *In-Water and Riparian Management of Sediment and Dredged Material* (TOGS

5.1.9). Testing will be conducted in accordance with the following procedures and methods (Table 5):

Table 5. Procedures and Methods for Sediment Sample Testing.

Contaminants	USEPA SW-846 Method
Pesticides (Including Mirex)	8081A
Herbicides (Including Silvex)	8151
Total Aroclors of PCB's	8082
Volatile Organics (VOC's)	8260B
Semi-VolatileOrganics (SVOC's)	8270C
Metals	6010B
Hexavalent Chromium	7196A
Cyanide	9012A
Sieve Analysis	D422
Total Organic Carbon (TOC)	9060A

The following information shall be collected and documented on an appropriate data sheet and submitted with the test results: field conditions, weather conditions, name of sampler, sample designation, collection method, soil description, photographs, and any pertinent information that may bear influence on sample analysis.

Samples shall remain in the custody of the sampler from the time the samples are taken through the delivery to the New York State-certified testing laboratory (Long Island Analytical Laboratories, Holbrook, NY). Custody will be transferred in compliance with all applicable standards. Care will be taken to ensure that all samples are uniquely identified, vital sample characteristics are preserved, correct samples are tested and traceable to their source, samples are protected from loss and/or damage, and sample information is recorded on a sample label that corresponds to a chain-of-custody form. A chain-of-custody form shall be completed for each sample in order to provide an accurate record that traces the possession and handling of each sample from the time of collection through performance of the analyses. Sample analysis and completion of laboratory analytical reports is expected within 14 days of sample delivery.

SAMPLE ANALYSIS

Segment A (see above) will be analyzed for grain size analysis, total organic carbon content, and all parameters identified in Table 2 of TOGS 5.1.9 and Table 375-6.8(b) of 6NYCRR Part 375 (Environmental Remediation Programs: Remedial Program Soil Cleanup Objectives). The Segment A grab sample will be used for VOC analysis and the Segment A composite sample for all non-VOC parameters including grain size and total organic carbon content. The methods of investigation, summary of findings and conclusions will be summarized in the *Final Conceptual Plan and Recommendations* report submitted to the PEP. The report will include soil boring logs, lab data sheets, and data summary tables.

2.3 SAMPLE HANDLING AND CUSTODY

Sampling handling and custody procedures are only applicable to the collection of sediment

samples for the Iron Point project and are described above in Section *2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point*).

2.4 ANALYTICAL METHODS

Analytical methods are only applicable to the collection of sediment samples for the Iron Point project and are described above in Table 5 in Section *2.2.3 (Collection of Sediment Samples and Laboratory Analyses for Contaminant Concentrations for Iron Point*).

2.5 QUALITY CONTROL

GPS Data - Following data correction, all features having a GPS-derived geometry shall be validated to ensure that each feature meets the accuracy requirements specified in Section 1.9.2-*Primary Data Acceptance Criteria* (3.3 m). During validation, the estimated accuracy of a GPS-derived feature is compared to the required accuracy. If the estimated accuracy is larger than the required accuracy, the feature is invalid. Each invalid feature listed in the GPS Feature Validation window shall be manually reviewed by project and QA/QC managers for compliance with precision standards and to determine if invalid features shall be edited, rebuilt, or deleted from the data set. In addition, at least three control or reference points shall be collected during each full day of field data collection (including at the beginning and end of the day) by obtaining a GPS position at a known location or feature.

Sediment Sampling and Laboratory Analysis for Iron Point- Please refer to *Section 2.2.3 for Quality Control procedures.*

2.6 INSTRUMENT TESTING, INSPECTION AND MAINTENANCE

According to Trimble, the GeoXH GPS receiver – that will be utilized for the field work – does not require a periodic testing or inspection program. GPS position data collection and processing is performed in a digital manner within the receiver through a microprocessor that is pre-programmed by the manufacturer. The only required maintenance of the GPS receiver entails software updates via download from the Trimble web site. Such updates incorporate software code enhancements by Trimble to improve device operation and any operational changes in the GPS satellite network. Land Use incorporate any updates to the GeoXH GPS; update notifications are provided automatically whenever the GPS receiver is connected to a desktop PC or laptop for download of position data.

The instrument constant of the Nikon Total Station shall be checked within 48 hours prior to the commencement of data collection to ensure that the instrument is performing properly. The manufacturer recommends that the instrument constant be checked several times per year. This is done by checking the accuracy of the horizontal distance estimate of the instrument against a known length such as a 200 ft tape measure.

2.7 INSTRUMENT CALIBRATION AND FREQUENCY

As discussed in Section 2.6 above, the GeoXH GPS receiver is a digital (i.e., non-analog) device which operates via a microprocessor; it is programmed for self-calibration as necessary. As such,

it does not require any manual calibration by the user. Updates to the GPS receiver software are incorporated when indicated by an automated download from the Trimble web site as discussed in Section 2.6.

The Nikon DTM-A5LG Total Station was adjusted and calibrated in June 2011 and received a National Institute of Standards and Technology (NIST) Certificate of Compliance with the instrument's stated accuracy and tolerances.

2.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Not Applicable

2.9 DATA MANAGEMENT

As stated previously, the written draft Final Report shall be delivered to the County and Peconic Estuary Program (PEP) Office at least two weeks prior to the Final Wrap-Up meeting where the Final Presentation of our findings, recommendations, and conceptual plans will be delivered to the County and stakeholders. The Final Report shall contain all relevant written materials, field data, maps, schematic plans, conceptual plans, and supporting digital data files developed during the completion of Tasks 2-4. Ten (10) hard color copies of the Final Report shall be provided and five (5) CDs containing a PDF of the Final Report and all associated data, files, maps, plans, digital data files, etc.

GPS Data - Field GPS data shall be exported from the GPS receiver into a Personal Geodatabase using ArcCatalog, corrected using the Differential Correction Wizard in ArcCatalog, and Validated using the GPS Feature Validation Tool in ArcMap. GPS data files shall be downloaded from the Trimble GPS receiver to a desktop computer equipped with TerraSync 5.1, GPS Analyst Extension, and ESRI ArcMap 10.0 software within 48 hrs of collection of data. Data collected by the Trimble GPS receiver is stored as an .SSF file. These files shall be imported into a Personal Geodatabase having the following properties:

- GPS-enabled
- Spatial Reference: NAD_1983_StatePlane_New_York_Long_Island_FIPS_3104_Feet. Note: Minimum z domain value shall be set to negative value as recommended for low-lying coastal areas in Trimble GPS Analyst Extension guidelines.
- Geographic Transformation: WGS_1984 to NAD_1983_StatePlane_New_York_Long_Island_FIPS_3104_Feet using WGS_1984_LITRF007_to_NAD_1983.

As described in Section 2.1.2 (Sampling Methods), data shall be postprocessed using the Differential Correction wizard to obtain anticipated 0.5m accuracy or better.

After data export, the back-up data file shall also be updated. GPS data shall be reviewed by the project and QA/QC managers for compliance with precision standards.

Site Photos

All photos taken at field sites shall include time stamps with date and time that the image was collected. The following file-naming convention shall be used for all photos collected for this project.

Each photo/image file will be named and saved according to the format
Site_Year Month Day_Time, where:
Site = NR for Narrow River, IP for Iron Point, SS for Stepping Stones Pond, BR for Big Reed Pond, MH for Meetinghouse Creek
Year = Four Digit Year
Month = Two Digit Year
Day = Two Digit Day
Time = Four Digit Time (24-hr Clock)

Environmental Data (including Laboratory Analytical Reports) for Narrow River Road, Iron Point, Lake Montauk, and Main Road MH-2 Projects

Field data sheets shall be developed for each project and completed during field investigations. Example field data sheets that may be used for stream reach assessments and wetland delineation and characterization are provide in Appendix E. All dimensional measurements, water velocities measurements, and other field notes shall be recorded on field data sheets. Field data sheets shall be photocopied and scanned within 48 hours of collection of data. Field data sheets shall not be transcribed. Original hand-written records/data sheets shall be scanned and maintained. Scanned copies of field datasheets shall be transferred to both project file and back-up file. Hard copies of data sheets shall be kept in a project specific binder by Land Use Ecological Services until at least September 30, 2021. All laboratory analytical reports for the Iron Point sediment samplings will also be kept as electronic files in both the project file and back-up file. Hard copies of laboratory analytical reports shall be kept in the project specific binder by Land Use Ecological Services until at least September 30, 2021.

3.0 ASSESSMENT AND OVERSIGHT

3.1 ASSESSMENTS AND RESPONSE ACTIONS

The environmental data collection component of each restoration projects is expected to take 1-4 days for each project. Due to the short period of time for the environmental data collection, it is not practical to have interim assessments of the environmental data collection procedures. Accordingly, the QA Manager at Land Use Ecological Services, Kelly Risotto, will conduct the Quality Control procedures described in Section 2.5 and will assess the field data sheets to ensure compliance with methodological procedures described in Section 2.4. If this assessment is deemed unsatisfactory then the environmental data collection shall be re-done or augmented, as necessary. The results of this assessment (and the date of the assessment) will be transmitted to the EPA Project Officer, the EPA QA Officer, and the Suffolk County Department of Health Services Project Manager. Any significant changes to procedures due to such assessments and

any non-compliance issues encountered will be reported to the EPA Project Officer and the EPA QA Officer and the Suffolk County Department of Health Services Project Manager. Should revisions or additions to the QAPP become necessary due to significant reported QA deficiencies or for any other reason, Land Use Ecological Services will submit a revised QAPP to EPA for approval.

3.2 REPORTS TO MANAGEMENT

The assessment of the environmental data collection and results of this assessment shall be sent to the EPA Project Officer, the EPA QA Officer, and the Suffolk County Department of Health Services Project Manager. No other additional QA-related reports are expected to be needed for this project. All other final reports and project deliverables are listed in Section 1.11: Documents and Records.

4.0 DATA VALIDATION AND USABILITY

4.1 DATA REVIEW, VERIFICATION AND VALIDATION

For the field data collected, data quality and assessment standards are described in Sections 1.9.2 (Data Acceptance Criteria), 2.2 (Sampling Procedures), and 3.1 (Assessments and Response Actions).

4.2 VERIFICATION AND VALIDATION METHODS

Field data will be verified by the QA Manager, who will examine field notebooks and datasheets to assess whether all QA processes were followed in accordance with this QAPP. Examination of field notebooks and datasheets shall be examined within a week of the first field data collection and then monthly until completion of the project. Data will be validated by determining whether it achieved the precision and accuracy goals listed above. Any data that could not be validated or verified will not be included in the final analysis and reports.

4.3 RECONCILIATION WITH USER REQUIREMENTS

There are no specific user requirements for the collected data; however, the sampling design has considered maximizing the potential for comparisons with existing and future data as discussed in the Comparability portion in Section 1.9.2 (Data Acceptance Criteria).

5.0 LITERATURE CITED

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APPENDIX A:
Location Maps for Project Sites

Town of Southold Parcel
Suffolk County Parcel
New York State Parcel
Private Parcel
Preliminary Study Area

NOTES:
1. 2016 parcel data from Suffolk County Real Property Tax Service Agency, used with permission.
2. 2016 orthoimage from NYS GIS Clearinghouse (gis.ny.gov).

N
1 in = 300 ft
0 80 160 320
Feet

Land Use Ecological Services, Inc

Prepared By: Land Use Ecological Services, Inc.
570 Expressway Drive South, Suite 2F
Medford, NY 11763

Project: Narrow River - Town of Southold
For: Peconic Estuary Program

Date: 3/20/2018 | Revised: | Scale: As Noted | Sheet: Base

NOTES:
1. 2016 orthoimage from NYS GIS Clearinghouse (gis.ny.gov).

N

1 in = 200 ft

0 50 100 200 Feet

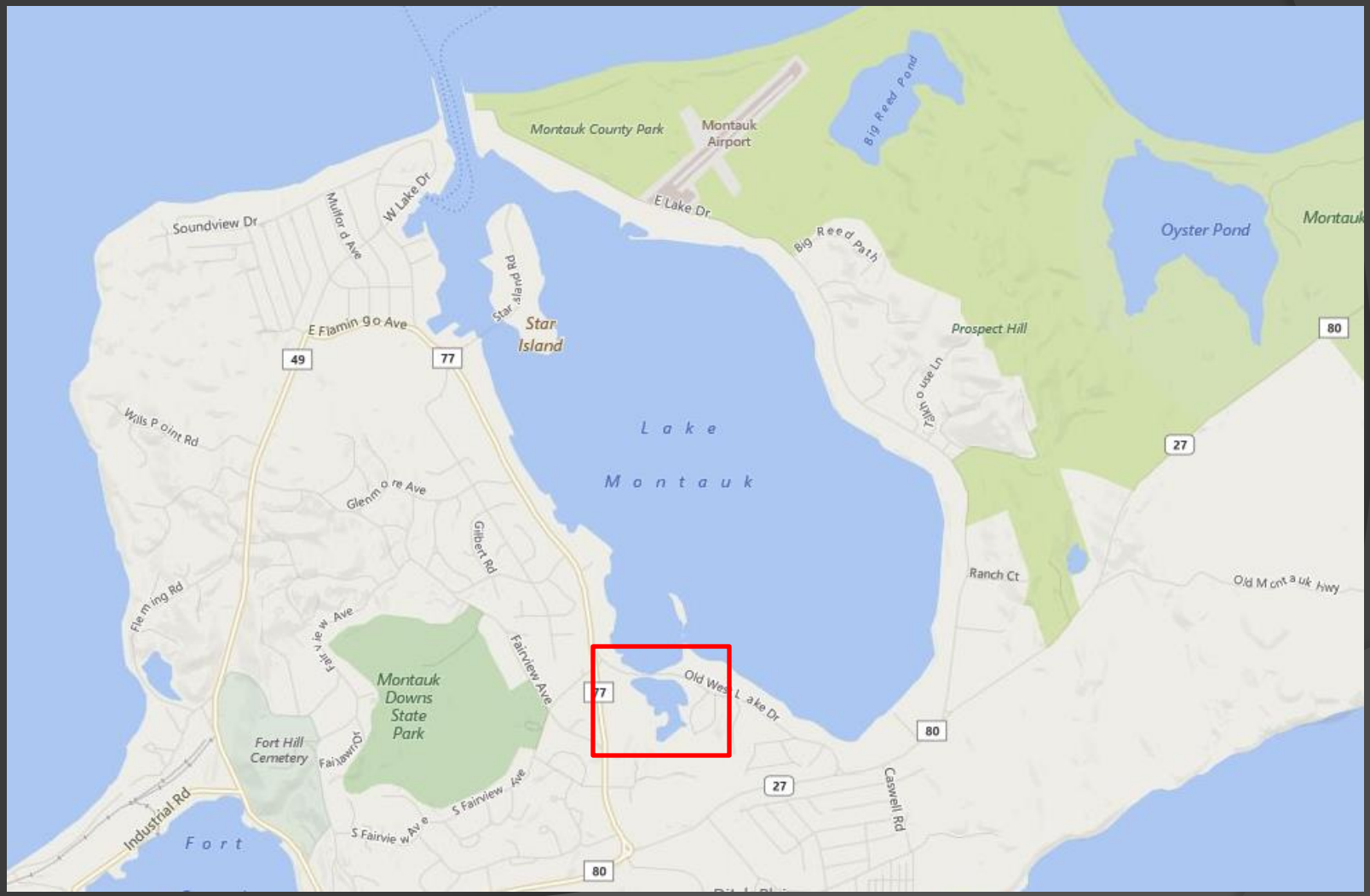
Land Use Ecological Services, Inc

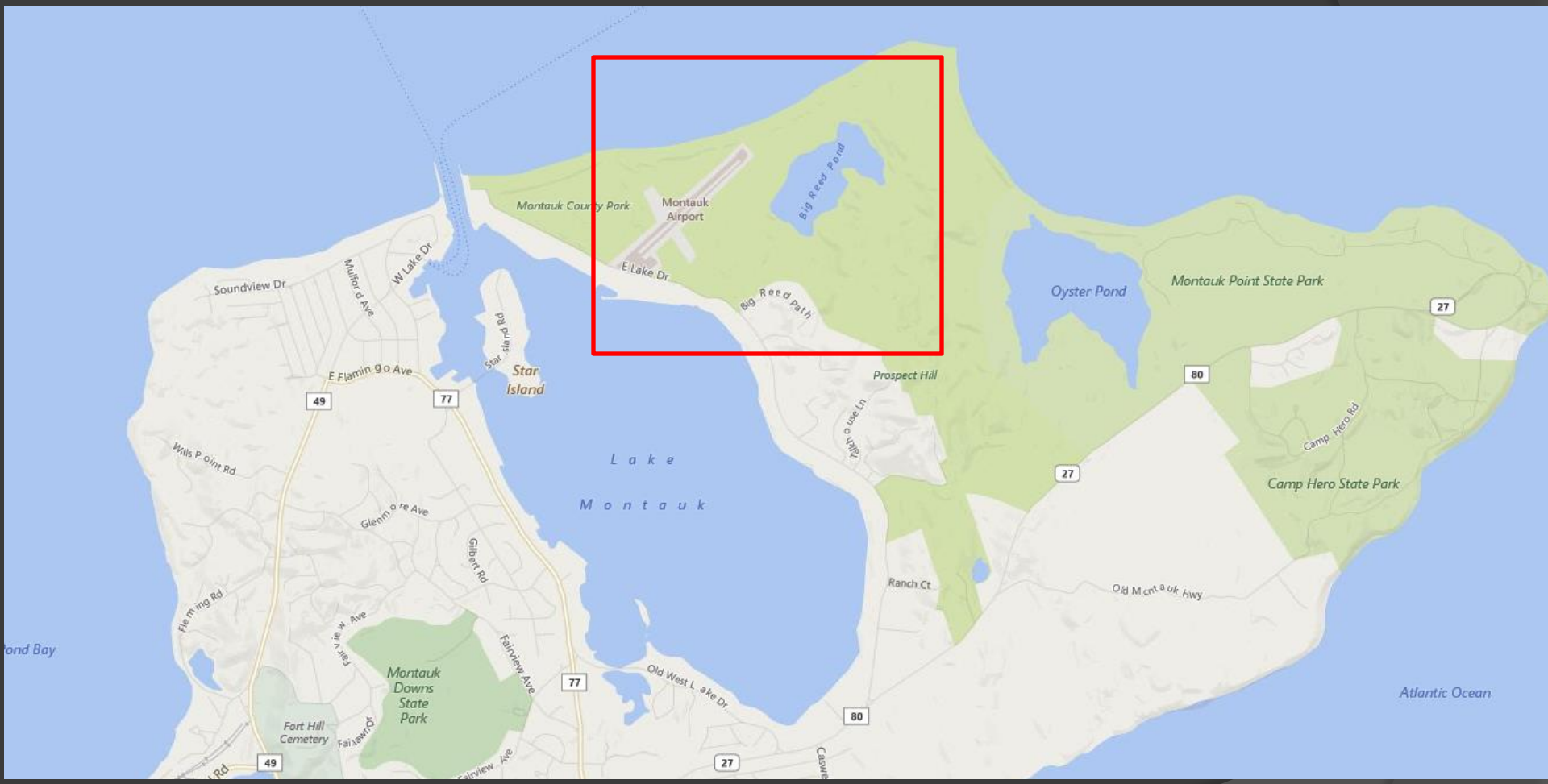
Prepared By: Land Use Ecological Services, Inc.
570 Expressway Drive South, Suite 2F
Medford, NY 11763
Drawn By: K. Risotto

Project: Iron Point - Town of Southampton
For: Peconic Estuary Program

Date: 3/20/2018	Revised:	Scale: As Noted	Sheet: Base Map

Stepping Stones Pond




Montauk County Park
Montauk Airport
Big Reed Pond
E Lake Dr
Big Reed Path
Oyster Pond
Montauk Point State Park
Soundview Dr
Multford Ave
W Lake Dr
Star Island
Star Island Rd
E Flamingo Ave
49
77
Prospect Hill
Old Montauk Hwy
27
80
Camp Hero Rd
Camp Hero State Park
Wills Point Rd
Lake Montauk
Glenmore Ave
Gilbert Rd
Fleming Rd
Fairview Ave
Montauk Downs State Park
Fort Hill Cemetery
Old West Lake Dr
Ranch Ct
Old Montauk Hwy
Atlantic Ocean

NOTES:
1. 2016 orthoimage from NYS GIS Clearinghouse (gis.ny.gov).

N
1 in = 100 ft
0 25 50 100
Feet

Land Use
Ecological Services, Inc.

Prepared By: Land Use Ecological Services, Inc.
570 Expressway Drive South, Suite 2F
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Project: Main Road - Town of Riverhead
For: Peconic Estuary Program

Date: 3/20/2018 | Revised: | Scale: As Noted | Sheet: Base Map

APPENDIX B:
General Location Map for Iron Point Reactive Barrier Project

Figure 2. Conceptual research-based permeable reactive barrier (black line) and cluster well monitoring upgradient and downgradient (blue Dots) . All well points will be flush with the surface and the reactive barrier is subsurface (>5' below the surface). Note that the location of the reactive barrier will be determined from well data and other factors, and is likely to change in the design phase.

APPENDIX C:
NYSDEC TOGS 5.1.9 and
Table 375-6.8(b) of 6NYCRR Part 375
(Environmental Remediation Programs:
Remedial Program Soil Cleanup Objectives

Department of Environmental Conservation

Division of Environmental Remediation

6 NYCRR PART 375

Environmental Remediation Programs

Subparts 375-1 to 375- 4 & 375-6

Effective December 14, 2006

New York State Department of Environmental Conservation

(b) Restricted use soil cleanup objectives.

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Metals							
Arsenic	7440-38-2	16[f]	16[f]	16[f]	16[f]	13[f]	16[f]
Barium	7440-39-3	350[f]	400	400	10,000 [d]	433	820
Beryllium	7440-41-7	14	72	590	2,700	10	47
Cadmium	7440-43-9	2.5[f]	4.3	9.3	60	4	7.5
Chromium, hexavalent [h]	18540-29-9	22	110	400	800	1[e]	19
Chromium, trivalent [h]	16065-83-1	36	180	1,500	6,800	41	NS
Copper	7440-50-8	270	270	270	10,000 [d]	50	1,720
Total Cyanide [h]		27	27	27	10,000 [d]	NS	40
Lead	7439-92-1	400	400	1,000	3,900	63[f]	450
Manganese	7439-96-5	2,000[f]	2,000[f]	10,000 [d]	10,000 [d]	1600[f]	2,000[f]
Total Mercury		0.81[j]	0.81[j]	2.8[j]	5.7[j]	0.18[f]	0.73
Nickel	7440-02-0	140	310	310	10,000 [d]	30	130
Selenium	7782-49-2	36	180	1,500	6,800	3.9[f]	4[f]
Silver	7440-22-4	36	180	1,500	6,800	2	8.3
Zinc	7440-66-6	2200	10,000 [d]	10,000 [d]	10,000 [d]	109[f]	2,480
PCBs/Pesticides							
2,4,5-TP Acid (Silvex)	93-72-1	58	100[a]	500[b]	1,000[c]	NS	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 [e]	17
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 [e]	136
4,4'- DDD	72-54-8	2.6	13	92	180	0.0033 [e]	14
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04[g]	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09
Chlordane (alpha)	5103-71-9	0.91	4.2	24	47	1.3	2.9

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
delta-BHC	319-86-8	100[a]	100[a]	500[b]	1,000[c]	0.04[g]	0.25
Dibenzofuran	132-64-9	14	59	350	1,000[c]	NS	210
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1
Endosulfan I	959-98-8	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan II	33213-65-9	4.8[i]	24[i]	200[i]	920[i]	NS	102
Endosulfan sulfate	1031-07-8	4.8[i]	24[i]	200[i]	920[i]	NS	1,000[c]
Endrin	72-20-8	2.2	11	89	410	0.014	0.06
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1
Polychlorinated biphenyls	1336-36-3	1	1	1	25	1	3.2
Semivolatiles							
Acenaphthene	83-32-9	100[a]	100[a]	500[b]	1,000[c]	20	98
Acenapthylene	208-96-8	100[a]	100[a]	500[b]	1,000[c]	NS	107
Anthracene	120-12-7	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benz(a)anthracene	56-55-3	1[f]	1[f]	5.6	11	NS	1[f]
Benzo(a)pyrene	50-32-8	1[f]	1[f]	1[f]	1.1	2.6	22
Benzo(b)fluoranthene	205-99-2	1[f]	1[f]	5.6	11	NS	1.7
Benzo(g,h,i)perylene	191-24-2	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Benzo(k)fluoranthene	207-08-9	1	3.9	56	110	NS	1.7
Chrysene	218-01-9	1[f]	3.9	56	110	NS	1[f]
Dibenz(a,h)anthracene	53-70-3	0.33[e]	0.33[e]	0.56	1.1	NS	1,000[c]
Fluoranthene	206-44-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Fluorene	86-73-7	100[a]	100[a]	500[b]	1,000[c]	30	386
Indeno(1,2,3-cd)pyrene	193-39-5	0.5[f]	0.5[f]	5.6	11	NS	8.2
m-Cresol	108-39-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
Naphthalene	91-20-3	100[a]	100[a]	500[b]	1,000[c]	NS	12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
o-Cresol	95-48-7	100[a]	100[a]	500[b]	1,000[c]	NS	0.33[e]
p-Cresol	106-44-5	34	100[a]	500[b]	1,000[c]	NS	0.33[e]
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8[e]	0.8[e]
Phenanthrene	85-01-8	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Phenol	108-95-2	100[a]	100[a]	500[b]	1,000[c]	30	0.33[e]
Pyrene	129-00-0	100[a]	100[a]	500[b]	1,000[c]	NS	1,000[c]
Volatiles							
1,1,1-Trichloroethane	71-55-6	100[a]	100[a]	500[b]	1,000[c]	NS	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27
1,1-Dichloroethene	75-35-4	100[a]	100[a]	500[b]	1,000[c]	NS	0.33
1,2-Dichlorobenzene	95-50-1	100[a]	100[a]	500[b]	1,000[c]	NS	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02[f]
cis-1,2-Dichloroethene	156-59-2	59	100[a]	500[b]	1,000[c]	NS	0.25
trans-1,2-Dichloroethene	156-60-5	100[a]	100[a]	500[b]	1,000[c]	NS	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1[e]	0.1[e]
Acetone	67-64-1	100[a]	100[b]	500[b]	1,000[c]	2.2	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06
Butylbenzene	104-51-8	100[a]	100[a]	500[b]	1,000[c]	NS	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76
Chlorobenzene	108-90-7	100[a]	100[a]	500[b]	1,000[c]	40	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1
Hexachlorobenzene	118-74-1	0.33[e]	1.2	6	12	NS	3.2
Methyl ethyl ketone	78-93-3	100[a]	100[a]	500[b]	1,000[c]	100[a]	0.12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Methyl tert-butyl ether	1634-04-4	62	100[a]	500[b]	1,000[c]	NS	0.93
Methylene chloride	75-09-2	51	100[a]	500[b]	1,000[c]	12	0.05
n-Propylbenzene	103-65-1	100[a]	100[a]	500[b]	1,000[c]	NS	3.9
sec-Butylbenzene	135-98-8	100[a]	100[a]	500[b]	1,000[c]	NS	11
tert-Butylbenzene	98-06-6	100[a]	100[a]	500[b]	1,000[c]	NS	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3
Toluene	108-88-3	100[a]	100[a]	500[b]	1,000[c]	36	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6
1,3,5- Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02
Xylene (mixed)	1330-20-7	100[a]	100[a]	500[b]	1,000[c]	0.26	1.6

All soil cleanup objectives (SCOs) are in parts per million (ppm).
NS=Not specified. See Technical Support Document (TSD).

Footnotes

[a] The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

[b] The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

[c] The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

[d] The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

[e] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

[f] For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.

[g] This SCO is derived from data on mixed isomers of BHC.

[h] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[i] This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.

[j] This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See TSD Table 5.6-1.

375-6.9 Development or modification of soil cleanup objectives.

(a) Applicability. This section identifies when and the procedures under which a contaminant-specific soil cleanup objective may be developed or modified.

(1) Soil cleanup objectives for contaminants not included in Tables 375-6.8(a) and (b) may be developed by the remedial party or required by the Department.

(2) Soil cleanup objectives for contaminants included in Tables 375-6.8(a) and (b), may be modified based on site-specific data if desired by the remedial party; as set forth in:

(i) subpart 375-3 for Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(iii) and subparagraph 375-4.8(c)(1)(iii).

(3) Protection of ecological resources soil cleanup objectives were not developed for certain contaminants, which are identified in Table 375-6.8(b) as "NS". Where such contaminants:

(i) appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources soil cleanup objective for the contaminant for use in Track 1 and apply such soil cleanup objective where it is lower than the soil cleanup objective set forth in Table 375-6.8(a); or

(ii) are identified as impacting or threatening an ecological resource for a restricted use remedial program the Department may require a protection of ecological resources soil cleanup objective be developed.

(b) New soil cleanup objectives must:

(1) Be developed utilizing the same methodologies that were used by the Department to develop the respective soil cleanup objective, as provided in the Technical Support Document.

(2) Apply the following caps, as set forth in section 9.3 of the Technical Support Document, on any soil cleanup objective included in Tables 375-6.8(a) and (b), with the exception of metals, as set forth in paragraph (3) below, developed for:

(i) unrestricted use, residential use, restricted-residential use and the protection of ecological resources, a maximum value of 100 ppm;

(ii) commercial use, a maximum value of 500 ppm; and

(iii) industrial use and the protection of groundwater a maximum value of 1000 ppm, and

(3) Apply a cap for metals at a maximum value of 10,000 ppm.

(c) Development of unrestricted use soil cleanup objectives. The unrestricted use soil cleanup objective for a compound will be the lowest of the soil cleanup values, calculated as set forth in appendix E of the Technical Support Document, for the protection of groundwater, protection of ecological resources and protection of public health.

(d) Development of restricted use soil cleanup objectives. The protection of:

(1) Groundwater soil cleanup objective will be the values calculated for the protection of groundwater as set forth in appendix E of the Technical Support Document;

(2) Ecological resources soil cleanup objectives will be the values calculated for the protection of ecological resources as set forth in appendix E of the Technical Support Document; and

(3) Public health cleanup objective will be the values calculated for the protection of public health for the identified use of the site, as set forth in appendix E of the Technical Support Document.

(e) Modification of soil cleanup objectives. The contaminant-specific soil cleanup objectives set forth at Tables 675-6.8(a) and (b)[1] may be modified by site specific data as set forth in this subdivision.

[1] Original should read "Tables 375-6.8(a) and (b)"

(1) Contaminant-specific soil cleanup objectives modified in accordance with this subdivision may be utilized by the remedial party for a site remedial program undertaken pursuant to:

(i) subpart 375-3 in Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(ii) and subparagraph 375-4.8(c)(1)(ii).

(2) For the calculation of a protection of groundwater or ecological resources contaminant -specific soil cleanup objective, the site-specific percentage of total organic carbon in the soil at the site may be substituted in the algorithms provided in appendix E of the Technical Support Document.

(3) For the calculation of a protection of public health contaminant-specific soil cleanup objective, site-specific data may be used to modify two of the five exposure pathways, as follows:

(i) for the particulate inhalation pathway six parameters rely on site-specific data; and

(ii) for the volatile inhalation pathway, four parameters rely on site-specific data.

(4) The algorithms to be used for each protection of public health pathway and details on the parameters which can be substituted are included in appendix E of the Technical Support Document.

(f) Use of soil cleanup objectives developed or modified. Once approved by the Department, contaminant-specific soil cleanup objectives developed or modified as set forth in this section may be utilized by the Department at other sites consistent with paragraphs (1) and (2) below.

(1) Contaminant-specific soil cleanup objectives developed for contaminants not included in Tables 375-6.8(a) and (b), as set forth in subdivision 375-6.9(b) above, will be used as guidance and shall be considered by the Department for inclusion in the Tables in this subpart during any subsequent reevaluation of the soil cleanup objectives, as set forth by ECL 27-1415.

(2) Contaminant-specific soil cleanup objectives modified for site specific parameters, as set forth in subdivision 375-6.9(e) above, may be utilized at sites manifesting similar parameters, if approved by the Department.

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Erin Crotty
Commissioner

Division of Water

Technical & Operational Guidance Series (TOGS) 5.1.9

In-Water and Riparian Management of Sediment and Dredged Material

November, 2004

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***** N O T I C E *****

This document has been developed to provide Department staff with guidance on how to ensure compliance with statutory and regulatory requirements, including case law interpretations, and to provide consistent treatment of similar situations. This document may also be used by the public to gain technical guidance and insight regarding how the department staff may analyze an issue and factors in their consideration of particular facts and circumstances. This guidance document is not a fixed rule under the State Administrative Procedure Act section 102(2)(a)(i). Furthermore, nothing set forth herein prevents staff from varying from this guidance as the specific facts and circumstances may dictate, provided staff's actions comply with applicable statutory and regulatory requirements. This document does not create any enforceable rights for the benefit of any party.

Date: November 29, 2004

TO: Regional Water Engineers, Division of Water Bureau Directors and Section Chiefs, Regional Habitat Managers, Regional Marine Habitat Protection Managers and Division of Fish, Wildlife and Marine Resource Bureau Directors and Section Chiefs

SUBJECT: Division of Water Technical and Operational Guidance Series (5.1.9)

In-water and Riparian Management of Sediment and Dredged Material

Originators: Frank Estabrooks, Karen Woodfield and Diane English

Purpose

To update and consolidate procedures for the in-water and riparian management of sediment and dredged material. The document outlines recommended procedures to be followed during dredging and dredged material management in riparian or in-water locations. This is a joint document developed by the Division of Water and the Division of Fish, Wildlife and Marine Resources. This document supersedes the NYSDEC Interim Guidance for Freshwater Navigational Dredging - 1994.

Discussion

This TOGS has been jointly produced by the NYSDEC Division of Water and the NYSDEC Division of Fish/Wildlife and Marine Resources (hereafter referred to as "Divisions"). The Divisions pursued the development of this TOGS in order to provide staff with guidance on the statutory and regulatory requirements for dredging activities and to promote uniformity in the certification and/or permitting of dredging projects throughout the state. This document applies to dredging and the in-water or riparian management of dredged material. For the purposes of this document the term dredging includes all in-water activities designed to move or remove sediment. Examples of such activities include but are not limited to mechanical and hydraulic dredging, mechanical plowing, trenching and jetting. Upland management of dredged material is not covered by this document. In regard to upland management, dredged material is considered a solid waste under 6 NYCRR Part 360, unless upland management/disposal is included under one of a number of specific permits as described in 6 NYCRR Part 360-1.2(a)(4)(ix). Beneficial use of dredged material as fill material, aggregate, or for other purposes may offer an alternative to in-water, riparian, or upland management of dredged material. NYSDEC Regional Solid Waste Engineers may be contacted concerning petitions for a beneficial use determination (BUD). Regulations covering BUD's in New York State appear under 6 NYCRR Part 360-1.15.

This TOGS is offered as an approach to environmental review of navigational dredging projects, dredging of channels and berths, dredging of ponds, trenching for pipelines and cables, and other incidental dredging in both marine and fresh waters of the state. This TOGS is not applicable to the review of dredging for industrial lagoons or dredging conducted for remediation or cleanup of sites managed by the Division of Environmental Remediation (DER) or Resource, Conservation, and Recovery Act (RCRA) corrective action sites. Sites managed by the DER include, but are not limited to, State Superfund sites, spills sites, environmental restoration program sites, brownfield cleanup program sites, and some RCRA corrective action sites. It should be noted that this TOGS is not intended to create any substantive or procedural rights, enforceable by any party in administrative or judicial litigation with the State of New York. While this TOGS contains numerical assessment criteria, it is not law or regulation. Discretion in applying the sediment quality parameters and the associated best management practices is expected and is defensible so long as human health and the environment are effectively protected. The Divisions also reserve the right, at anytime, to modify this TOGS subject to applicable laws, regulations and updated scientific information.

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Sandra Allen, Director
Division of Water

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I. INTRODUCTION

A. Discussion

This TOGS has been produced by the NYSDEC Division of Water and Division of Fish/Wildlife and Marine Resources (hereafter referred to as "Divisions") to provide staff with guidance on the statutory and regulatory requirements for dredging activities and to promote uniformity in the certification and/or permitting of dredging projects throughout the state. Dredging is an integral part of the maintenance of New York's harbors, channels, fairways, canals, marinas, ports, terminals, and reservoirs. For this reason, a uniform and balanced approach to dredging projects is important.

This document applies to dredging and the in-water or riparian management of dredged material. **For the purposes of this document the term dredging includes all in-water activities designed to move or remove sediment. Examples of such activities include but are not limited to mechanical and hydraulic dredging, mechanical plowing, trenching and jetting. For the purpose of this TOGS, "riparian" is defined as the 100 year flood plain plus any adjacent wetland integral to the surface water**. Dredged material destined for upland management or dredged material to be managed outside of New York State would be subject to different procedures and may require a different set of analyses and approvals. In regard to upland management within New York Sate, dredged material is considered a solid waste under 6 NYCRR Part 360, unless upland management/disposal is included under a dredging or other permits as described in 6 NYCRR Part 360-1.2(a)(4)(ix). Beneficial use of dredged material as fill material, aggregate, or for other purposes may offer an alternative to in-water, riparian, or upland management of dredged material. NYSDEC Regional Solid Waste Engineers may be contacted concerning petitions for a beneficial use determination (BUD). Regulations covering BUD's in New York State appear under 6 NYCRR Part 360-1.15.

To clarify the sampling, testing and certification and/or permitting process, this document provides an explanation of the requirements of state law that apply to dredging projects with a general overview of relevant federal requirements. This TOGS is offered as an approach to environmental review of navigational dredging projects, dredging of channels and berths, dredging of ponds, trenching for pipelines and cables, and other incidental dredging in both marine and fresh waters of the state. This TOGS is not applicable to the review of dredging for industrial lagoons or dredging conducted for remediation or cleanup of sites managed by the Division of Environmental Remediation (DER) or Resource, Conservation, and Recovery Act (RCRA) corrective action sites. Sites managed by the DER include, but are not limited to, State Superfund sites, spills sites, environmental restoration program sites, brownfield cleanup program sites, and some RCRA corrective action sites.

It should be noted, however, that this TOGS is not intended to create any substantive or procedural rights, enforceable by any party in administrative or judicial litigation with the State of New York. While this TOGS contains numerical assessment criteria, it is not law or regulation. Discretion in applying the sediment quality parameters and the associated best management practices is expected and is defensible so long as human health and the

environment are effectively protected. The Divisions also reserve the right to modify this TOGS subject to applicable laws, regulations and updated scientific information.

B. Required Approvals

There are a number of federal, state and local regulatory controls in place which apply to dredging projects. The applicability of these controls to each operation depends on the particular circumstances of each case, such as the sediment classification and the intended use or management of the material. However, the following descriptions can be used as an index of the current regulatory demands on projects which will result in either disposal or beneficial use of dredged material. Applicants are advised to contact NYSDEC or US Army Corps of Engineers (USACE) personnel for a case specific referral to applicable laws.

Some or all of the following State and Federal Permits may be required: Use and Protection of Waters Permit; Freshwater Wetlands Permit; Tidal Wetlands Permit; State Pollutant Discharge Elimination System Permit; Clean Water Act (CWA) § 401 Water Quality Certification; and CWA § 404 Permit and Rivers and Harbors Act § 10 Permits, issued by the USACE. An antidegradation review and Wild, Scenic and Recreational Rivers Program permits may also be required.

Use and Protection of Waters

Article 15 of the Environmental Conservation Law (ECL) and its implementing regulations found at 6 NYCRR Part 608 apply to most dredging projects. A Use and Protection of Waters permit is required by 6 NYCRR Part 608.2(a) whenever: there is to be a change, modification or disturbance of any protected stream; the bed or bank of a protected stream in the State will be disturbed; or sand, gravel or other material is to be removed. Part 608.5 also requires a permit for the excavation or placement of fill directly or indirectly in navigable waters. This includes marshes, estuaries, tidal marshes and wetlands that are adjacent to and contiguous at any point to any of the navigable waters of the State, and that are inundated at mean high water level or tide. Water Quality Certifications required by Section 401 of the federal Water Pollution Control Act are incorporated into the State regulations in Part 608.9.

Freshwater Wetlands Permits

Under the Freshwater Wetlands Act (ECL Article 24) and 6NYCRR Part 663, NYSDEC regulates activities in freshwater wetlands and in their regulated 100 feet wide adjacent areas. NYSDEC regulates such activities to prevent, or at least to minimize, impairment of wetland functions. Almost any activity which may adversely impact the natural values of the wetlands or their adjacent areas is regulated. Some activities requiring a permit include: dredging, construction of buildings, roadways, septic systems, bulkheads, dikes, or dams; placement of fill, excavation, or grading; modification, expansion, or extensive restoration of existing structures; drainage, except for agriculture; and application of pesticides in wetlands. In addition, a Freshwater Wetlands Permit pursuant to the Adirondack Park Agency (APA) Executive Law may be required from the APA for work on wetlands located within the Adirondack Park. A “Shoreline Clearing Variance” could also be required from the APA.

Within the Adirondack Park a permit would be required from the NYSDEC for work on State owned lands, or from the APA for work on private lands.

Tidal Wetlands Permits

Under the Tidal Wetlands Act (ECL Article 25) and 6NYCRR Part 661, NYSDEC administers a permit program regulating activities in tidal wetlands and their adjacent areas. In general, tidal wetlands consist of all the salt marshes, non-vegetated as well as vegetated flats, and shorelines subject to tides including areas now or formerly connected to tidal waters. The adjacent areas extend up to 300 feet inland from the wetland boundary (up to 150 feet inland within New York City). NYSDEC requires a permit for almost any activity which will alter wetlands or the adjacent areas.

State Pollutant Discharge Elimination System (SPDES) Permits

In certain instances a SPDES permit may be required. A discharge of a pollutant from a point source to the surface or ground waters of the state requires a SPDES permit. There is an exception from the SPDES permit requirement for "dredged or fill material discharged into navigable waters" in 6 NYCRR Part 751.3(a)(6). SPDES permits are required for discharges of dredged material effluent from point sources to groundwater, and permanent dredged material treatment facilities. Discharges that do not require a SPDES permit will be regulated under a 401 Water Quality Certificate.

Clean Water Act §401 Water Quality Certification.

Section 401 of the Federal Water Pollution Control Act requires that certain federal activities, including projects that require federal permits such as § 404 Permits and Federal Energy Regulatory Commission (FERC) hydroelectric permits, must obtain a 401 Water Quality Certification from the State. A Water Quality Certificate is a statement from the agency responsible for water quality indicating that the project will comply with State technology and water quality standards. Generally dredging projects require a Water Quality Certification from the State. The 401 Certification may contain conditions that will be enforced by the Federal Agency issuing approval (i.e., USACE).

Clean Water Act §404 Permit and Rivers and Harbors Act §10 Permit

Additional permits may be necessary from the USACE under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the federal Water Pollution Control Act. The USACE regulates the placement of fill or dredged material and the construction of certain structures in waterways and wetlands. The USACE jurisdiction has expanded beyond major waterways to include all waters of the United States. A Rivers and Harbors §10 Permit is required for any activity that may obstruct a navigable water and for the excavation or fill of navigable waters. This statute also applies to management activities such as in-place or ex situ capping, treatment, or subaqueous containment of sediments if the proposed activity will alter or modify the course, location, condition, or capacity of any navigable water of the United States.

Additionally, a CWA §404 permit is required when dredged material is discharged in U.S. waters.

Antidegradation Review

An antidegradation review may be required for Great Lakes Basin dredging projects. See NYSDEC Technical & Operational Guidance Series (TOGS) 1.3.9 for details.

Wild, Scenic and Recreational Rivers Program

The Wild Scenic and Recreational Rivers Program could potentially require permits for work on designated wild, scenic or recreational rivers. Within the Adirondack Park a permit would be required from the NYSDEC for work on State owned lands, or from the APA for work on private lands.

C. Jurisdictional Considerations

While it is generally acknowledged that certain types of dredged material may potentially exhibit 6 NYCRR Part 371 (Part 371) hazardous waste characteristics, most navigational dredging operations have not historically tested excavated sediments for hazardous waste characteristics.

On October 30, 1998, the United States Environmental Protection Agency (EPA) signed new rules for the management of contaminated media. The new rules contain a provision to clarify the relationship of the Resource Conservation and Recovery Act to dredged material. Specifically, the rules establish that "dredged material disposed of in accordance with a permit issued under section 404 of the Federal Pollution Control Act [33 U.S.C. S1344] or in accordance with a permit issued for the purpose of transporting material for ocean dumping under section 103 of the Marine, Protection, Research and Sanctuaries Act of 1972 [33 U.S.C. 1413] is not a hazardous waste" (RCRA) (40 CFR section 261.4[g]).

Other agencies that may have jurisdiction in dredging projects are the New York State Department of State and the New York State Office of General Services. The New York State Canal Corporation also has jurisdiction over dredging activities conducted on NYS owned lands under its jurisdiction.

D. Application Process

Primary responsibility for managing dredging permit applications rests with the Department's Division of Environmental Permits. Applicants must apply for necessary dredging permits on a Joint Application for Permit form and submit this form to the NYSDEC Regional Permit Administrator, in the regional office serving the project location. This form and supporting documentation will suffice as an application to the Department for a Protection of Waters Permit, 401 Water Quality Certification, freshwater wetlands, tidal wetlands. A copy of the

Joint Application will be forwarded to the USACE, by the Department. The USACE will contact the applicant for additional information to complete their review. If a SPDES permit is required, the applicant should complete an Industrial Application Form NY-2C and submit this with the Joint Application to the Regional Permit Administrator.

An Environmental Assessment form must also be completed and submitted with the joint application. The Environmental Assessment form is used to help assess whether the proposed action may have a significant adverse impact on the environment and may require the preparation of an Environmental Impact Statement. This assessment is required by the State Environmental Quality Review Act (SEQR) and State Environmental Quality Review regulations (Part 617).

Applications for dredging permits are subject to the Uniform Procedures Act (ECL Article 70, UPA) and Uniform Procedures regulations (Part 621). These regulations identify required application information and specify deadlines by which applications and supporting documentation must be reviewed by the Department. The UPA regulations also require the simultaneous submission of all required applications, encourage public participation, and seek to ensure timely and thorough reviews of all regulated actions. Division of Environmental Permits staff will advise as to all the components necessary for a complete permit application. For information on the Division of Environmental Permits' project management role, see Commissioner Cahill's March 14, 2000 Memorandum: Permit Management System.

1. Description of Application Process and Technical Review

The following provides an outline of the basic steps for sediment assessment and management in dredging projects.

STEP 1 PRE-APPLICATION MEETING

! Hold pre-application meeting(s) with the applicant to explain how the project should be described, and all application and information needs. The applicant should contact Division of Environmental Permits staff to arrange a pre-application meeting. Environmental Permits staff will involve the appropriate Department technical staff. Other agencies having jurisdiction may also be invited to attend the pre-application meeting.

! The coordination of smaller dredging projects into one large project may have benefits both in disposal options available and in the reduction of sampling costs. If small dredging projects are in close proximity to each other and can be coordinated easily by the applicants, such coordination can be beneficial to all involved parties.

STEP 2 DETERMINE SAMPLING REQUIREMENTS

A sampling plan should be submitted to the Divisions prior to sampling to ensure proper characterization of the proposed dredged material. The sampling plan should specify the type, number, and location of samples as well as laboratory analyses and analytical methods.

! Screen for Exemptions (see Chapter II, Section B.1)

! Identify Numbers and Locations of Samples (see Chapter II, Section B.2) Based on:

- o site contamination history
- o sampling history
- o dredging history
- o site resources/sensitivity

! Identify chemical analytes including grain size, TOC and analytes from Table 1 with additional case-specific analytes as necessary. If upland management of dredged material is planned, contact Division of Solid and Hazardous Materials for additional testing requirements.

STEP 3 REQUIRE LABORATORY ANALYSIS OF SAMPLES

! Follow laboratory protocols (see Table 1)

! Use New York State Department of Health (NYSDOH ELAP: Environmental Laboratory Approval Program) approved laboratory

! Report results based on identified quantitation levels (see Table 1)

STEP 4 EVALUATE RESULTS

! Determine dredged material classification for intended riparian/in-water management as Class A, B or C (see Table 2 and Chapter III, Section B.)

! Determine need for possible further sampling/analysis if high level of contamination is indicated

STEP 5 DETERMINE APPROPRIATE DREDGING/MANAGEMENT OPTIONS

! Determine dredging technology to be used based on appropriate sediment class (A, B, C), (see Table 3)

! Determine riparian/in-water management options based on sediment class (see Table 3)

STEP 6 DEVELOP PERMIT CONDITIONS FOR DREDGING AND DREDGED MATERIAL MANAGEMENT (Chapter V, Section C)

STEP 7 MONITOR OPERATIONS, AS NEEDED (see Chapter V, Section D)

2. Applicant Requirements for Description of Dredging Projects

The applicant should describe the physical, chemical and biological characteristics of proposed dredging and management sites in enough detail for the Divisions to estimate impacts and determine appropriate conditions governing conduct of the project.

a. Dredge Area.

! Physical - Show limits of excavation for areas targeted for dredging on a location map with a scale of no greater than one-inch to 100 feet (1:1200). When in-water disposal is proposed or when dredging in a sensitive habitat, provide bottom contours and profiles at no greater than one foot intervals before and after the proposed dredging. Detail the proposed method of dredging and indicate specific methods of operating equipment to minimize resuspension and migration of sediments.

Include an estimation of dredged material volume and if possible, estimate the length of time needed to complete dredging and transport. If applicable, summarize prior dredging operations that have occurred in this area and include any sediment chemistry, and total organic carbon (TOC) data available.

! Chemical - Sediment core samples should be collected to a depth of at least one foot below maximum proposed dredge depth or to bedrock, whichever is less. Log and analyze cores for sediment quality parameters, grain size, TOC and Unified Soils Classification System (USCS) classification. Homogenize and analyze each individual core down to dredging depth. Do not composite single or multiple cores if the grain size, TOC, and likelihood of contamination history indicate that individual horizons may be significantly different in sediment contaminant characteristics. Instead, sample and analyze the horizons separately or contact the Division of Water for guidance. If appropriate (see Chapter II, Section B.2.a), separately analyze a sample segment representing the top six inches of the sediment to be exposed after dredging.

The number of core samples required of each project may vary according to site-specific information. Chapter II elaborates on the proposed sampling plan approval process.

Water quality analyses and hydrology may also help establish baseline conditions.

! Biological - Describe existing habitat and characterize its use by biota, including rare, threatened or endangered species of special concern. Identify specially protected or regulated habitat.

b. Placement area (In-water and Riparian).

! Physical - Indicate location of the placement area on a plan or map having a minimum scale of 1:24,000. This plan or map should show the surrounding topography, 100 year flood-plain

elevation contour, cultural features, wildlife habitats, wetlands, and known or suspected sources of contaminants, such as point-source discharges, landfills, nearby water supply intakes or wells, primary and principal aquifers and any other site-specific features that would be useful in defining this proposed placement area. Represent the placement site on a site plan at an appropriate scale. The site plan should contain pre- and post-placement elevations of the site at intervals of no greater than one foot. The Divisions may require the plan to describe bottom sediments according to the USCS, along with their relevant parameters, such as TOC and grain size. Describe the method of transporting dredged material to the placement area and the manner of placement.

! Chemical - For proposed in-water placement, characterize existing surface sediment, chemical quality of the water-column and hydrology using the same parameters employed in evaluating the dredge area. Indicate sampling locations on plan or map.
For riparian placement onto previously dredged sediments, the intent is not to degrade the existing sites. The top two feet of the existing surface soils should be analyzed for contaminant loading to confirm that the contaminant level of the dredged material to be disposed of at the site does not exceed the contaminant level at the receiving site. Physical properties such as grain size and permeability should also be measured.

! Biological - Describe existing habitat and characterize its use by biota, including use by rare, threatened or species of special concern. Identify specially protected or regulated habitat. Describe post placement habitat conditions.

! Deed Restrictions - If Class C sediment is placed in a riparian area, and capped with Class A material, there may need to be provisions for deed restrictions, so that excavation beneath the Class A sediment cover would trigger management of the Class C sediments as a solid waste.

II. SEDIMENT QUALITY PARAMETERS AND SAMPLING REQUIREMENTS

Each dredging site and management area may have unique physical and chemical characteristics which will influence both the number of samples required to obtain a representative characterization of the sediment and the chemical analytes targeted in testing. Sediment testing is the most critical step in any dredging operation as proper or improper sediment characterization can have long lasting impacts on both the dredged area and the management site. Along with the physical, chemical and biological descriptions required in Chapter I, Section D.2., core sample collection and analysis will lead the applicant to more informed dredged material management decisions. The Divisions have selected a number of chemical analytes that may be tested for and these are identified in section A of this chapter. Section B describes the sampling and analysis requirements for sediment classification. If upland management of dredged material is a possible option, contact the Division of Solid and Hazardous Materials for additional testing requirements.

The TOGS relies on whole sediment chemistry analysis for determining the level of contamination and best management practices for the excavated dredged material. There are several reasons for relying on whole sediment chemistry analysis. Whole sediment chemistry is used in other Department guidance documents that predominantly rely on the Equilibrium Partitioning methodology. One such document is the Division of Fish, Wildlife, and Marine Resources, 1999, "Technical Guidance for Screening Contaminated Sediments". The whole sediment chemistry testing method is consistent with baseline values already measured in the Division of Water's sediment assessment and monitoring program and is used in scientific geochemical literature for soils and sediments.

The use of whole sediment chemistry in this TOGS is a consistent choice for sediment testing, and it has the added benefit of being simpler and less expensive than the extract concentrations used in the Toxicity Characteristic Leaching Procedure (TCLP) or the biotoxicity/bioaccumulation testing protocols.

The sampling required by the Divisions to determine whether to grant a dredge permit is <u>not</u> the same testing required by the USACE. It is acknowledged that for some dredging projects, or for in-water placement of dredged material at an EPA-designated site, the USACE may require applicants to conduct a suite of biological tests to support their permit application. If such test results are available, and considered sufficient to characterize the material to be dredged, and especially if open water placement is planned, the Divisions may elect to use this information (see Chapter III, Section B. 4) to make permit decisions in lieu of or in addition to whole sediment chemistry test results . When sediment contamination (Class B or C) is expected at the dredge site, the Divisions may still require whole sediment chemistry analysis in order to determine the appropriate best management practices to be implemented during the dredging or placement operations. Under USACE requirements, sampling would be required for open water placement according to the most recent version of "Evaluation of Dredged Material Proposed for Ocean Disposal Testing Manual" (USACE, Green Book) or "Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual Inland Testing Manual" (USACE Gold Book). The Divisions may also require mixing zone analyses (see Chapter V, Section C) based on the biological test results.

A. Chemical Selection

A key element to this TOGS is the selection of chemicals for analysis and the evaluation of dredging and management options. The Divisions, therefore, focused on chemicals known to be both toxic and persistent in the environment for the in-water/riparian protocol. The Divisions selected these chemicals as important to sediment evaluation. The list includes all chemicals for which there are fish flesh consumption advisories in New York State:

PCB
chlordane
DDT and its metabolites
mercury
dioxin
cadmium
mirex

Table 1 contains the suggested analytical methods for detection of selected chemicals and references the detection limits of those analytical methods.

In the aquatic environment, these chemicals can bioaccumulate to elevated levels. Fish consumption is the primary exposure path for humans and wildlife. Sediment quality threshold values (discussed in Chapter III and listed in Table 2) for all of the above, except DDT, are based on toxicity to aquatic benthic life. The DDT threshold value is based on the protection of wildlife. The threshold values are all lower than those that would be derived to assure that fish tissues do not exceed human health advisories. Table 1 contains the threshold values below which the sediment is considered to exhibit no appreciable contamination. Table 2.1 in Chapter III provides more details on the derivation of the threshold values. The substantial, dual threat from these chemicals to both human and aquatic life warrants their selection as sediment quality parameters.

Other substances selected for testing include:

BTEX, the sum of benzene, toluene and xylene concentrations, was selected as a general indicator of petroleum contamination (i.e., gasoline). BTEX can be a problem for aquatic life in areas associated with land-based petroleum or petroleum-use facilities, marinas, and/or spills.

Benzene is a known human carcinogen and deserves separate analysis from BTEX. Human exposure to benzene can occur from drinking contaminated surface or groundwater. However, the Screening Value for Benzene in Table 2 is derived for protection of benthic life.

Arsenic is widely distributed in the environment and forms a variety of organic and inorganic compounds, some of which are very toxic to aquatic organisms. Some arsenic compounds are readily absorbed by intestinal tract and muscle tissue.

Lead is a persistent bioaccumulative chemical of growing concern to public health managers. Evidence of bioaccumulation in aquatic life to levels of concern for human health is currently

sparse. The paths of lead to human exposure include contaminated soils and drinking water. Lead is also toxic to benthic life.

Copper is toxic to aquatic life, but is not known to be the source of widespread or severe damage to aquatic life in New York State waters. When copper contamination and adverse effects are known or suspected, the metal should be required for sample analysis.

Dieldrin was selected as a common indicator of pesticide use. It is bioaccumulative and the primary path of exposure to humans and wildlife is through the consumption of contaminated fish. Dieldrin is also toxic to benthic life, which is the basis for the Screening Value in Table 2.

Total Polycyclic Aromatic Hydrocarbons (PAH) generally show little tendency to biomagnify in food chains, although in some cases of high contamination, elevated PAH body burdens in fish and bivalves have occurred. Sediment concentrations of Total PAHs in sediments from as low as 4 ppm and certainly higher than 35 ppm are toxic to benthic life. Several compounds of the PAH family are known human carcinogens. PAH's are found in soils, air, surface waters and plant and animal tissues as a result of natural processes such as forest fires, microbial synthesis and volcanic activities. Anthropogenic sources of PAH's cause higher concentrations along transportation corridors, industrial sites and in urban soils resulting from the long term use of fossil fuels (i.e., coal and petroleum) and petroleum-derived products (i.e., asphalt pavement). Total PAH is an indicator of possible impact from the spectrum of PAH compounds.

NOTE: Copper, dioxin, chlordane, BTEX and mirex are case specific analytes. The analysis and evaluation of these case specific analytes is recommended for those waters known or suspected to have sediment contamination caused by those chemicals. In the case where known discharges or spills of other potentially harmful chemicals have occurred, in or near a dredge site, or in the case of potential water quality limiting substances (see appendix A) these other analytes should be included along with those listed in Tables 1 and 2. In the case where a marina is to be dredged, BTEX may be a parameter of concern due to past gasoline spillage into the water and possible accumulation into the sediments. These determinations are made at the discretion of Division staff.

Table 1 - revised 9/25/06

Method Detection Limits and Suggested Analytical Methods

Parameter Sediment/Soil	EPA Method CLP\RCRA	Required Method Detection Limits (mg/kg, ppm)	No Appreciable Contamination (Threshold Values (mg/kg, ppm)
Metals			
Arsenic	Metals - EPA 6010B	3.0	<14
Cadmium	Metals - EPA 6010B	1.0	< 1.2
Copper+	Metals - EPA 6010B	5.0	< 33
Lead	Metals - EPA 6010B	2.0	< 33
Mercury *	Metals - EPA 6010B, 7470	0.2	< 0.17
PAH's and Petroleum-Related Compounds			
Benzene	EPA 8021, 8260B	0.0003	< 0.59
Total BTX+	EPA 8021, 8260B	0.0008	< 0.96
Total PAH	EPA 8270	0.33	< 4
Pesticides			
Sum of DDT+DDE+DDD *	EPA 8081A	0.0033	< 0.003
Mirex *+	EPA 8081A	0.189	< 0.0014
Chlordane +	EPA 8081A	0.0017	< 0.003
Dieldrin	EPA 8081A	0.0033	< 0.11
Chlorinated Hydrocarbons			
PCBs (sum of aroclors)	EPA 8082	0.033	< 0.1
Dioxin (Toxic Equivalency Total)+	EPA 1613B	0.000002	< 0.0000045
Physical Properties			
Grain Size	ASTM D41/D42		
Total Organic Carbon	EPA 9060A		

* Note: Threshold values lower than the Method Detection Limits are superseded by the Method Detection Limit.

+ Indicates case specific analytes.

B. Sampling and Analysis Requirements

Core samples should be collected and analyzed, at a laboratory certified by the New York State Department of Health (ELAP), to characterize the physical and chemical properties of the sediment in situ, prior to a dredging operation. Physical analysis should include grain size and TOC determinations. Chemical analysis should include appropriate chemical analytes and method detection limits from Table 1 with additional case-specific analytes as necessary. Evaluation of the analytical results of these samples will help determine the management and/or reuse options that can be considered, the types of dredging equipment that might be employed, and the environmental controls that may be necessary to reduce the potential impacts to fish and wildlife during dredging operations.

1. Sampling Exemptions

There are instances where sediment testing is not necessary and these exclusions are detailed below. If there are no recent spill incidents (within the past ten years) and there are no known present or historical contamination problems associated with the site or its environs, sampling and analysis of sediments for proposed dredging projects will generally not be required under the following circumstances:

a. The material to be dredged is at least 90% sand and gravel.

or

b. The entire project involves less than 1,500 cubic yards of dredged material.

or

c. The Divisions determine that the site has been appropriately sampled and analyzed within the last five years and that data reveals sediments with no appreciable contamination. The Division of Water's Sediment Assessment and Management Section maintains an extensive database of results of chemical analyses of sediment from locations throughout the state. Information from the database can be provided to applicants upon request.

Note: Sampling exemptions are not generally available for projects involving open water placement. Additional sampling waivers may be applicable on a case by case basis.

2. Collection of Samples to Characterize Sediment

A sampling plan should be submitted to the Divisions prior to sampling, indicating the type, number and location of samples to ensure proper characterization of the proposed dredged material.

a. Type of Sample. Sediment core samples should represent the complete depth of the material to be dredged, plus an additional one foot of material that will represent the new sediment surface. Sampling procedures are described in Appendix C. Methods of underwater investigation using free-fall gravity corers, or other equipment, and of logging cores and mapping sediments are given in Hunt (1984), ASTM (1993) and similar publications.

Each core should be broken into two segments:

! A segment homogenized over the complete dredging depth should be analyzed to determine the physical and chemical properties of the sediment to be dredged. Do not homogenize the core if the grain size, TOC or likelihood of contamination based on core lithology or known contamination history indicates that individual horizons within the core may be significantly different in sediment quality. Instead, sample and analyze the horizons separately or contact the Divisions for guidance.

!

! A segment representing the top six inches of the sediment to be exposed after dredging should be archived for possible future analysis (see Table C-3 in Appendix C for holding times and storage requirements). If chemical analysis of the dredging depth segment reveals Class B or C (Table 2) sediments, then some or all of these substrate segments may need to be analyzed to determine the risk of increased contamination exposure after dredging.

b. Number and Location of Samples. The applicant should propose how many samples will be collected, explain how this number was derived and why it is adequate to characterize the dredged material, including the detection of potential "hot spots" of highly contaminated sediments. The plan should also detail the locations of the sampling sites and state how they afford spatial representativeness while also providing coverage for areas likely to have been affected by specific contamination (i.e., a sampling bias should exist toward areas known to be affected by outfalls, tributaries, other industrial sources, historical spill areas, etc.). The number of samples should take into account project area, depth of dredging, potential heterogeneity of the sediments both horizontally and vertically and contaminant source locations. Projects that require dredging of relatively homogenous sediments will require fewer samples than those that require dredging of heterogeneous sediments. Sampling should preferably include no less than three sample locations for any given project. Examples of various methods for calculating how many samples would provide spatial representativeness in order to characterize a dredge site are presented in Appendix B.

c. Cost Reduction Strategies. In the case of small projects, small marina operations, etc., strategies are available to manage the cost of the analyses. These strategies should yield a reasonably accurate representation of the spatial and vertical stratigraphy and contaminant distribution in the area to be dredged and take into account historical and current pollutant inputs. Divisions approval should be obtained before any of the sample size reduction strategies are used. Unless otherwise exempt from the sampling requirements, a minimum of three sediment samples should be analyzed to characterize any proposed dredging project.

Cost reduction strategies may include:

i. Collect the required number of cores, then select those with the highest organic carbon levels and closest to known/potential contaminant sources for analysis. If the results of the initial analysis are valid, representative and indicate clean material, the other cores could be assumed likewise. More specifically, if the sediment with the highest silt and clay fraction reveals no appreciable contamination, then it is likely that relatively coarser textured samples would reveal similar or less contaminated results. If the results indicate contamination, however, then the other cores could be assumed similarly contaminated or they could be analyzed by the applicant.

ii. Collect the required number of cores and composite those with similar characteristics (e.g., grain size, TOC, color, etc.) for analysis. If this is done, a record of the cores that were composited, including their percentages of total organic carbon and USCS descriptions, as well as the post-compositing analytical results, should be submitted to the Divisions. Do not composite the cores if the grain size, TOC or likelihood of contamination based on core lithology or known contamination history indicates that individual horizons between the cores are appreciably different in sediment quality. Instead, sample and analyze the horizons separately or contact the Divisions for guidance.

iii. These strategies may also be used to reduce the number of substrate samples that need to be analyzed to characterize the sediment to be exposed as a result of the dredging operation. Analysis cost may also be reduced, for these samples, by limiting the analytical parameters to those found to be at Class B or C concentrations in the dredging depth segments.

d. Quality Assurance and Quality Control The goal of the sampling strategies presented in this TOGS is to provide sediment data which are accurate, representative and legally defensible. Therefore, the importance of Quality Assurance/Quality Control (QA/QC) measures in sampling sediments cannot be overlooked. Failure to use proper containers and appropriate methods of sample

collection and preservation, collect an adequate number and type of QC samples, provide strict sample identification and chain-of-custody documentation and employ correct laboratory procedures can limit data usability, or render sample results invalid.

The project-specific sampling and analysis plan for each dredging application should include a description of the project QA/QC program. The NYSDEC Analytical Services Protocol (ASP), dated June 2000, provides the in-laboratory QA/QC requirements and should be referenced and adhered to in the project QA/QC program. All data that might be subject to challenge, should be reported via ASP Category B deliverables. Otherwise, at least twenty-five percent of samples should be reported as ASP Category B deliverables. In-field QA/QC requirements should be specified in the project sampling and analysis plan. These requirements should include, but not necessarily be limited to: sample collection methods; decontamination of sampling equipment; sample container selection; sample preservation methods; number and type of QC samples (i.e. Matrix Spike/Matrix Spike Duplicate [MS/MSD], duplicates, etc.) to be collected; sample identification; and chain-of-custody procedures.

The Divisions' general guidelines for the number and type of QC samples to be collected is presented in Appendix C of this TOGS. These guidelines may be modified on a project-specific basis at the discretion of the Divisions. Also presented in Appendix C, are guidelines for the selection of sample containers and preservation methods, a sample chain-of-custody form, sampling procedures, and a glossary of selected QA/QC terminology and qualifiers.

III. EVALUATION OF RESULTS

After sediment sampling and analysis is complete, the proposed dredged material may be classified according to sediment type to allow the selection of an appropriate management option. This chapter provides the threshold values for in-water/riparian placement, in-water/riparian management options, and the methods employed for applying sampling results to the classification scheme. Chapters IV and V describe how sediment classification impacts dredging and in-water and riparian management of dredged material.

A. Sediment Quality Thresholds For In-water/Riparian Placement

The Divisions have carefully considered how sediment data should be structured and analyzed. This consideration has resulted in a classification system where sediment is placed in classes dependent upon its chemistry. The derivation of the sediment quality guidelines used in the classification system is consistent with the methodologies described in the Technical Guidance for Screening Contaminated Sediments (NYSDEC-DFWMR 1999). The Divisions have established three classes of sediment quality thresholds for dredged material proposed for in-water/riparian placement. Based on the concentration of contaminants identified during the chemical analyses, sediment to be dredged is classified as Class A, B or C (Table 2). Management options are identified in Table 3 for each class. This system differs from EPA's categorical system for in-water placement that is based on bioaccumulation and biotoxicity.

1. Class A - No Appreciable Contamination (No Toxicity to aquatic life).

If sediment chemistry is found to be at or below the chemical concentrations which define this class, dredging and in-water or riparian placement, at approved locations, can generally proceed.

2. Class B - Moderate Contamination (Chronic Toxicity to aquatic life).

Dredging and riparian placement may be conducted with several restrictions. These restrictions may be applied based upon site-specific concerns and knowledge coupled with sediment evaluation.

3. Class C - High Contamination (Acute Toxicity to aquatic life).

As defined in Table 2, Class C dredged material is expected to be acutely toxic to aquatic biota and therefore, dredging and disposal requirements may be stringent. When the contaminant levels exceed Class C, it is the responsibility of the applicant to ensure that the dredged material is not a regulated hazardous material as defined in 6NYCRR Part 371. This TOGS does not apply to dredged materials determined to be hazardous. Questions regarding hazardous waste, should be referred to the Department's Division of Environmental Remediation.

Table 2 Sediment Quality Threshold Values for Dredging, Riparian or In-water Placement

Threshold values are based on known and presumed impacts on aquatic organisms/ecosystem. Where fresh water and marine threshold values differ sufficiently, the marine value is presented in parentheses. All concentrations are in mg/kg dry weight.

Compound	Class A	Class B	Class C	Derivation Code
Metals (mg/kg)				
Arsenic	< 14 (8.2)	(8.2) 14 - 53	> 53	1
Cadmium	< 1.2	1.2 - 9.5	> 9.5	1
Copper*	< 33	33 - 207 (270)	> 207 (270)	1
Lead	< 33 (47)	33 (47) - 166 (218)	> 166 (218)	1
Mercury[+]	< 0.17	0.17 - 1.6 (1.0)	> 1.6 (1.0)	1
PAHs and Petroleum-Related Compounds (mg/kg)				
Benzene	< 0.59	0.59 - 2.16	> 2.16	2
Total BTEX*	< 0.96	0.96 - 5.9	> 5.9	2
Total PAH[1]	< 4	4 - 35 (45)	> 35 (45)	1
Pesticides (mg/kg)				
Sum of DDT+DDD+DDE[+]	< 0.003	0.003 - 0.03	> 0.03	2
Mirex*[+]	< 0.0014	0.0014 - 0.014	> 0.014	2
Chlordane*[+]	< 0.003	0.003 - 0.036	> 0.036	1
Dieldrin	< 0.11	0.11 -0. 48	> 0.48	2
Chlorinated Hydrocarbons (mg/kg)				
PCBs (sum of aroclors)[2]	< 0.1	0.1 - 1	> 1	3
2,3,7,8-TCDD*[3] (sum of toxic equivalency)	< 0.0000045	0.0000045 - 0.00005	> 0.00005	4

[+] Threshold values lower than the Method Detection Limit are superseded by the Method Detection Limit. (See Table 1)
* Indicates case-specific parameter (see Chapter II, Section A) .
[1]For Sum of PAH, see Appendix E
[2]For the sum of the 22 PCB congeners required by the USACE NYD or EPA Region 2, the sum must be multiplied by two to determine the total PCB concentration.
[3]TEQ calculation as per the NATO - 1988 method (see Appendix D)

Note: The proposed list of analytes can be augmented with additional site specific parameters of concern. Any additional analytes suggested will require Division approved sediment quality threshold values for the A, B and C classifications.

Table 2.1 Derivation Codes for Chemical Threshold Values

Derivation Code	Explanation
1	Values are the geometric mean (GM) between Long & Morgan (1990) and Persaud (1992). Class A values are the GM of ER-L[1] and Lowest Effect Level. Class C values are the GM of the ER-M[1] and Severe Effect Levels. The resulting GMs were compared to marine water ER-L and ER-M values published by Long & Morgan (1992). When compared, the lowest of the two corresponding values was selected. When there was a large difference between a freshwater (Long & Morgan (1990) or Persuad (1992) GM) and a saltwater (Long & Morgan 1992) value, the marine value was recorded in parentheses, and is applicable to marine water dredging and management only. For total PAHs, Persaud (1992) had no toxicity values so only those of Long and Morgan (1990) were used. This approach is consistent with that described in the Technical Guidance for Screening Contaminated Sediments Document (DFW/DMR 1999). The Chlordane values were developed by NYSDEC generally following the Long and Morgan method.
2	NYSDEC water quality standards were used in conjunction with the U.S. EPA equilibrium partitioning methodology (see DFW/DMR 1993, pages 5-11) to calculate sediment quality threshold values for organic compounds assuming 2% organic carbon and equating K_{ow} to K_{OC}, consistent with the reality of contaminant uptake in biological organisms (Kenaga and Goring, 1980). Class A value is for the protection of benthic life from chronic toxicity. The Class C value is for the protection of benthic life from acute toxicity. If aquatic life standards were not available from 6NYCRR Part 703.5 to generate the sediment screening criterion, a guidance value was derived in accordance with 6 NYCRR Part 706.1. For total BTEX, the A and C values are the geometric means of the A and C values for benzene, xylene, ethylbenzene, and toluene. For DDT (sum of DDT, DDD, & DDE), the A value was based upon the 6 NYCRR 703.5 standard for the protection of wildlife. Because this value (0.00022 mg/l) was below the limit of analytical detection, the analytical detection limit of 0.003 mg/l was selected as a default value. The C value was the level at which significant mortality to *daphnia magna* has been documented (Long & Morgan, 1990). This approach is consistent with that described in the Technical Guidance for Screening Contaminated Sediments Document (DFW/DMR 1999).
3	Synthesis of Consensus Based Sediment Quality Assessment Values (D.D. MacDonald, et, al., Jan 2000), Marine and Estuarine Sediment Quality Values (E.R. Long, et. al., Nov 1993), PCB soil cleanup levels in NYSDEC Division of Environmental Remediation TAGM HWR-92-4046 and of sediment quality values from NYSDEC Division of Fish, Wildlife and Marine Resources Technical Guidance for Screening Contaminated Sediments, 1998.
4	A mean of the NYSDEC Fish and Wildlife bioaccumulation number, of the USEPA's low risk to mammals, the disposal of paper sludge in pasture land and the bioaccumulation protection of fish values, was calculated and rounded down to the nearest 0.5 ppt. This value is 0.0000045 ppm or 4.5 ppt. Additionally, the soil/sediment action level for 2,3,7,8 TCDD in the RCRA hazardous waste program (TAGM DHSR 3028, 1992) is 4.5 ppt. The on-land application limit of 50 ppt is used as the contaminated level from the USEPA - Paper Industry Agreement from Environment Reporter, 29 April 1994, pages 2222-3.

[1] **Error! Main Document Only.**The ER-L values are the concentrations equivalent to the lower 10 percentile of the screened available data and indicated the low end of the range of concentrations in which effects were observed or predicted (concentrations above which adverse effects may begin). The ER-M values were the concentrations equivalent to the 50 percentile point in the screened available data (concentrations above which effects were frequently observed or predicted).

Table 3 RIPARIAN/IN-WATER Management Options

Activity	Class A	Class B	Class C
Dredging	Any means meeting generally accepted and approved practices	Closed bucket suggested or any means meeting environmental objectives	Closed bucket or other method minimizing loss of resuspended sediment ordinarily required
Riparian Placement	Any means meeting generally accepted and approved practices	Placement at riparian sites already containing more contaminated material. New riparian sites should be covered with Class A sediments to insure isolation of the dredged material. The depth of the cap will be determined on a site specific basis.	Riparian sites should be lined and capped with clay or other impermeable material and covered with Class A sediments to ensure long-term isolation of the dredged material from the environment. The depth of the cover material will be determined on a site specific basis.
In-water Placement	Any means meeting generally accepted and approved practices	In water placement discouraged. When applicable, sites should be capped with Class A sediment to insure isolation of the dredged material	In-water disposal ordinarily precluded.
Barge Overflow	Barge overflow may be allowed (site specific)	Usually, no barge overflow. May be allowed on site specific basis	No barge overflow
Post dredging Monitoring	May be required	See Chapter V	See Chapter V

NOTES:

1. Environmental Objectives for Dredging, Chapter IV, Section A applies to all classes.
2. Environmental Objectives for Dredged Material Management Placement at Riparian and/or In-water Sites, Chapter IV, Section B applies to all classes.
3. Riparian sites are adjacent to or within the 100-year flood plain of the surface waters in which dredging is proposed. These sites are typically diked with controlled outlets for retention of sediment and are typically regulated under Section 401 of the CWA. They do not constitute “on-land” placement.
4. Due to site specific circumstances, an applicant has full responsibility to justify all operations, including both those described above and any other selected alternatives.
5. Depending on conditions, hydraulic dredging to a confined disposal facility or excavation in the dry is the recommended method for PCB concentrations of greater than 10 ppm. Dredged material should be disposed of directly at final disposal sites. An applicant may justify another method of dredging and disposing of this material, as long as no net dumping of contaminated dredged material is proposed. If concentrations approach 50 ppm, Division of Environmental Remediation should be consulted.

B. Application of Sampling Results

1. Because these dredge and placement or disposal levels are based upon a limited number of screening parameters, one or more exceedances of a threshold in any level may be considered presumptive evidence that dredged material management should meet the restrictions of the more stringent level. However, judgment should be applied in interpreting the results. For example, failure of only one sample may be an analytical or sampling anomaly. Failure of two or three samples within a reasonable range of statistical, analytical variability may also not warrant special treatment. Biological testing may be used as an additional tool to evaluate the level of classification of the dredged material (See Section B.4). Consult with Division of Water and the Division of Fish, Wildlife, and Marine Resources staff in these cases before classifying material.

2. If one or more samples exceed Class C (high contamination, acute toxicity) thresholds for sediment quality, in-water disposal will likely be precluded. For riparian placement, the Division of Solid & Hazardous Materials staff and if necessary the Division of Environmental Remediation staff should be consulted to determine further site characterization needs and to assess dredging and disposal requirements (i.e., Part 373 site or other facility).

3. In the event that dredging may expose more highly contaminated sediments, as evidenced by the analysis of a sample segment representing the top six inches of the sediment to be exposed after dredging, prevent or limit exposure by one of the following options:

- dredge to a shallower depth than originally proposed;
- dredge to a greater depth until cleaner sediments are exposed; or
- dredge to a greater depth and then cap with available cleaner material.

4. Biological Testing of Dredged Material for Management Options.

Although the Divisions do not routinely require biological testing, the Army Corps of Engineers (USACE) may require applicants to conduct a suite of biological tests to support their federal dredging permit application. If such test results are available and considered sufficient to characterize the material to be dredged, and especially if open water placement is planned, the Divisions may elect to use this information in lieu of or in addition to whole sediment chemistry test results to make permit decisions for dredging and management of dredged material. When sediment contamination (Class B or C) is expected at the dredge site, the Divisions may still require whole sediment chemistry analysis in order to determine the appropriate best management practices to be implemented during dredging or placement operations.

Biological testing conducted to satisfy federal regulations and guidance usually consists of:

! 24-96 hour elutriate (suspended particulate and water) dilution series assays
! 10 day solid phase acute toxicity assays

- 28 day solid phase bioaccumulation assays.

If toxicity and bioaccumulation testing indicates a lower level of concern for acute and chronic effects than the corresponding sediment chemical results, then the Divisions, after evaluating project specifics (such as proximity of sensitive habitats and water use areas, the volume of material, the duration and seasonal window of the dredging, or the characteristics of the contaminant(s) of concern) would have the option of approving the management of the material at a lower classification level.

For more information on biological testing and the application of test results, see Appendix F.

IV. GENERAL GUIDELINES FOR DREDGING AND IN-WATER AND RIPARIAN MANAGEMENT OF DREDGED MATERIAL

This Chapter discusses management objectives for dredging and riparian and in-water placement of dredged material, design considerations for riparian placement facilities, and guidelines for monitoring activities during dredging and placement activities. These measures may help minimize any impacts incident to dredging and may ensure the long term protection of the dredged material placement area. The beneficial reuse of dredged material should be promoted when practical. It is important to keep the following objectives in mind so that aquatic habitats, wetland habitats, and riparian areas are protected.

A. General Dredging Guidelines

1. Environmental Objectives for Dredging

Dredging projects should comply with the specific provisions of all permits issued for the activity and should be planned, permitted and conducted toward achieving the following environmental objectives:

- Minimize the resuspension of silt, oil and grease and other fine particles or materials by careful equipment operation, floating booms, silt curtains or screens and other suitable means.

- Minimize the amount of material disturbed or returned to the water body. For mechanical dredging of sediments containing contaminant concentrations at levels of concern, the use of a closed, watertight bucket and the elimination of barge overflow may be required.

- Avoid damage to nearby wetlands and habitats from dredging activities.

- Avoid known historical or archaeological sites and minimize impacts if any previously unknown sites are discovered.

- Avoid dredging in particular water bodies during fish migration and spawning periods specified by the Division of Fish, Wildlife and Marine Resources for species of concern. Timing restrictions may be eased or lifted for small, closely monitored dredging projects, if the use of containment measures, such as silt curtains, adequately isolate the site during fish spawning and rearing periods.

- Avoid littoral zones and any adverse impacts to the littoral zone whenever possible.

- Avoid exposing benthic organisms to more highly contaminated underlying material.

2. Best Management Practices

Best Management Practices (BMP's) that meet the environmental objectives for dredging may include, but are not limited to, the following options. BMP's should be chosen with

consideration of site and project specific conditions and apply to all dredged material regardless of how it is to be managed.

Clamshell Dredge: When using a clamshell dredge, the amount of suspended solids dispersed during the dredging operation should be minimized by maximizing the size of the bucket used for dredging. This minimizes the number of "bites" needed to dredge a particular site. Bucket retrieval rates should be controlled to minimize turbidity. The spuds or anchors of the haul barge should be carefully placed outside the contaminated area to reduce resuspension of contaminated sediments. When off loading dredged material using a clamshell or backhoe, the bucket should not swing over open water.

Closed Clamshell: The closed clamshell bucket reduces the amount of suspended solids in the upper water column at the site of dredging. A closed clamshell bucket may be required when the sediments to be dredged contain contaminants at levels of concern as determined by the Divisions or if warranted by site specific conditions. Bucket retrieval rates should be controlled to minimize turbidity. The spuds or anchors of the haul barge should be carefully placed outside the contaminated area to reduce resuspension of contaminated sediments. When off loading dredged material using a clamshell or backhoe, the bucket should not swing over open water. The environmental bucket should have a sealing system to minimize the loss of material during transport through the water column. Excessive loss of water from the bucket should be investigated and repaired. An experienced bucket dredge operator with sufficient control over bucket depth, bucket closure and bucket hoist speed should be used.

Hydraulic Dredge: Hydraulic dredging, a vacuum-suction dredging process, is preferable when the placement site is within pumping distance of the dredge site. This type of dredge reduces the resuspension of suspended solids at the dredge site. However, large volumes of high percent water content material are created by this method and this water may require greater settling time and/or treatment prior to discharge.

Barge Overflow: No barge overflow should be allowed during transport of dredged material outside the dredged area. Barge overflow may be allowed during the dredging operation if the dredged material is determined to be Class A material. It should be avoided during the dredging operation if the dredged material is Class B or Class C (See Table 3) or if there are site specific reasons for not approving its use with Class A material.

Silt curtains: Silt curtains, can greatly reduce the long-term turbidity occurring during the dredging operation in water current flows of less than 1 foot per second (ft/sec). Silt curtains have been used to protect tidal creeks near the dredging area. Very poor silt curtain performance can be expected in flows of greater than 1 ft/sec. Controlling long term turbidity may also be accomplished using sheet pilings to cut off the disturbed area during work.

Shunting: Shunting, pumping via pipe of the free water in a barge to the bottom of the water column, may be permitted as an alternative to barge overflow as long as no disruption of in-place sediments occurs.

Tidal Periods: In certain semi-enclosed water bodies, dredging may only be allowed during the incoming tide. This practice may minimize the dispersal of contaminated sediments by allowing time for settling of suspended sediments.

Dredging Inspectors: In some cases, independent USACE certified dredging inspectors may be required to observe the dredging operation and report on compliance with permit requirements.

Coffer dam dewatering: Some dredging projects may include the construction of a coffer dam in the water column, with dewatering of the coffer dam prior to the dredging operation. Coffer dam dewatering should be conducted in a manner so as to preclude visible increases in turbidity or sheens in the waterbody. If the underlying sediments to be dredged are Class C, coffer dam dewatering effluent may need to be treated (settling, filtering, etc) prior to discharge back to the waterbody.

Flocculent addition: The proposed addition of a flocculent, during sediment dewatering operations, requires the submission of the Water Treatment Chemical (WTC) Usage Notification Requirements for SPDES Permittees form if the dewatering effluent is to be discharged to waters of the State. The permittee must demonstrate that any flocculent remaining in the effluent will not be toxic to organisms in the receiving water.

B. General Guidelines for In-Water and Riparian Management of Dredged Material

1. Environmental Objectives for Dredged Material Management at Riparian and/or In-water Sites

a. Riparian sites.

! New placement sites should not be located in wetlands or other specially protected or regulated habitats or in identified significant habitats.

! Placement within the 100 year flood-plain may be limited if the fill would cause an increase in the backwater elevation of a given flood event.

! Contaminated material should be covered with Class A sediments to a depth that ensures the long-term isolation of dredged material from the surrounding environment.

! Sites planned for use during multiple dredging seasons should be covered, with an interim cover that is equivalent to the final cover, if the period between use exceeds three years for Class B material and one year for Class C sediments. The need for an interim cover can be determined on a case-by case basis, depending on the bioaccumulative nature of the contaminants of concern. Alternatively, a dredging project that involves sediments with different levels of contamination may be dredged so that the most contaminated sediments are placed at the disposal site first and are then subsequently covered with cleaner sediments.

! Use of and maintenance of existing sites should minimize impacts to nearby wetlands. Any material re-excavated from riparian placement areas for other use should meet the sediment quality requirements for the other use.

! Placement sites should be maintained and operated to prevent the uncontrolled release of sediments beyond the boundary of the site or into surface waters.

b. Non-capped, In-water sites.

! In-water placement should be limited to dredged material that is homogeneous, consists of generally coarse grained material and shows no evidence of appreciable contamination. In water placement should only be used when practicable on-land or riparian management alternatives are not available.

! In-water placement of contaminated dredged material in any “clean” area viewed as an economic or environmental resource of New York State should be discouraged. As an example, such areas might support sand mining, commercial or sport fishing and/or be near public bathing beaches.

! In-water placement of dredged materials at EPA-designated sites will continue to be a viable option, since these sites have undergone environmental review, are authorized for such placement, and have established sediment criteria.

! The placement area should not be located in specially protected or regulated habitats or identified significant habitats.

! In-water placement activities must be approved by the Divisions and must minimize intrusion into littoral areas.

! The resuspension of fine-grained materials should be minimized for in-water placement areas by use of silt curtains, floating booms, the proper selection and careful operation of equipment and other suitable means.

! Characteristics of the dredged material should be similar to existing characteristics at the placement area to ensure that aquatic communities will reestablish themselves.

c. In-water capped sites.

These sites should be limited to moderately contaminated sediments (Class B) when no upland or riparian management sites are available.

In addition to the considerations in item b above, the following apply.

! Site-specific biological surveys, toxicity and bioaccumulation testing may be required for approval and for post-placement monitoring. These studies should

support the contention that biota exposed to the site after placement will not contain appreciably more body burdens of contaminants and will not experience acute or chronic toxicity.

! Existing depressions and old excavations (e.g., borrow pits) should be considered before any new excavations are created. Capping with Class A sediments and leveling to surrounding bottom contours will likely be required.

! Cap material should be deposited in a thickness that will provide long-term isolation of the dredged material from the overlying water. Capping material should have the same characteristics as the surrounding bottom sediments to prevent differential scouring and encourage re-establishment of benthic communities.

! Placement area should not be proposed for future dredging or mining; it must be recorded on USGS, NOAA or other appropriate maps, using Universal Transverse Mercator (UTM) or New York Transverse Mercator (NYTM) coordinates.

2. Design Consideration for Riparian Confined Disposal Facilities

For the purpose of this TOGS, “riparian” is defined as the 100 year flood plain plus any adjacent wetland integral to the surface water. Riparian confined disposal facilities are by this definition any facility located within the 100 year flood plain or adjacent wetland. Other names for a confined disposal facility may be upland disposal site or containment site. These sites are typically diked with controlled outlets for retention of sediment and are typically regulated under Section 401 of the CWA. They do not constitute “on-land” placement.

1. Riparian disposal facilities should be located, where possible, on soils with low permeability (i.e., Soil Conservation Service soil groups C and D).

2. The disposal facility should retain dredge water for the time required to meet discharge conditions (see Chapter V, Section A). The volume needed to provide this retention period should be in addition to the volume needed for solids storage. Disposal facilities designed to receive solids from more than one dredging cycle should use any excess volume to increase the retention period to the maximum practicable extent.

3. Inlet and outlet openings should not be placed directly in-line with each other unless baffles are in place to provide adequate settling time.

4. A minimum water depth of three feet should be provided for retention, using a controlled-outlet weir, in a disposal facility served by a hydraulic dredge. The weir overflow rate should be controlled in order to achieve an acceptable effluent concentration for suspended solids.

5. The length-to-width ratio of the disposal facility should be greater than two to one where the length is the distance between the inlet and the outlet.

6. A baffle could be constructed as part of the outfall structure to prevent the release of floating debris and oils.

7. The outlet should convey the discharge in an erosion-free manner, preferably to an existing stable channel.

NOTE: The prime objective of these design considerations is to enable reasonable capture of fine grain sediments, which contain most of the contaminants. Any number of engineered methods can increase fine grain capture. Design of confined disposal facilities for Class C sediments are site-specific and should ensure optimal fines (see glossary) capture to retain pollutants.

V. PERMIT CONDITIONS FOR DREDGING AND DREDGED MATERIAL MANAGEMENT

The dredging permit or Water Quality Certification may contain special conditions which will vary depending upon dredged material classification, where discharges are directed, or where sediment generated from dredging operations is placed.

When discharges associated with dredging operations are directed outside of the dredging area, the receiving water may experience loadings of new pollutants. These loadings should be reviewed in accordance with Division of Water's TOGS 1.2.1 and TOGS 1.3.1. These TOGS should be followed for calculating the total maximum daily loading (TMDL) and to determine if any water quality based effluent limits are necessary. The dredging permit or 401 Certification would then be conditioned with any applicable water quality based limits, technology limits, requirements for best management practices, mixing zone limits, and monitoring requirements.

When discharges associated with dredging operations are directed back into the dredge area, and if no new pollutants are added to the dredged material, the discharge may not need to be reviewed to determine an allowable TMDL. The dredging permit or 401 Certification could then be conditioned with applicable technology limits or narrative water quality standards, BMPs, mixing zone limits, and monitoring requirements.

A. Water Quality Based Limits and Technology Limits

A mixing zone can be assigned at the site of dredging, at the site of in-water placement of dredged material and at the effluent discharge from on-water processing, on-land processing, and confined disposal facilities (see Section C, following). The narrative limits presented in Table 4 apply at the edge of any defined mixing zone and should be included as conditions in the 401 Certification or dredging permit. For water quality limiting substances (Appendix A) and parameters measured at levels higher than Class A threshold values in the dredged material, concentrations at the edge of the mixing zone should not exceed water quality standards or background conditions plus an allowance for analytic variability.

Table 4 Section 703.2 Narrative Water Quality Standards

Parameter	Classes	Standard
Turbidity	AA, A, B, C, D, SA SB, SC, I, SD	No increase that will cause a substantial visible contrast to natural conditions
Suspended, Colloidal, and Settleable Solids	AA, A, B, C, D, SA SB, SC, I, SD, A-special	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages

For effluent from on-water or on-land processing and confined disposal facilities, an alternative to meeting water quality standards at the edge of an established mixing zone would be setting effluent limits at the point of discharge (e.g. at the weir). The following options would be available:

The applicant can suggest and justify a maximum limit for TSS and/or turbidity at the point of discharge (e.g. at the weir). This justification should demonstrate that the proposed limit will not cause detrimental effects to the environment or to human health. This case specific-number should be developed with attention to existing background concentrations of TSS in the receiving water, to any and all localized water quality limiting substances or chemicals of concern, and to the proximity of any critical water use areas or sensitive habitats. The Divisions will evaluate the justification of the proposed limit with the goal of ensuring environmental protection and that no exceedance of water quality standards are likely to occur.

-or-

The following default technology limits at the point of discharge (e.g. at the weir) may be used as dredging permit or 401 Certification conditions:

- total suspended solids - 200 ppm;
- settleable solids - monitor; (no limit)
- chlorides - none greater than 110 percent of the background concentration; and
- for water quality limiting substances and tested parameters at levels higher than Class A level - limits determined by procedures outlined in TOGS 1.2.1 and TOGS 1.3.1 for developing TMDL's.

B. Best Management Practices.

Best management practices (BMPs) during dredging and dredged material management operations should be included as conditions in the 401 Certification or dredging permit if appropriate. These practices should protect sensitive resources in the vicinity of dredging or dredged material management activities and may include:

- Operational controls, during dredging, such as the use of a closed bucket, a controlled bucket speed or cycle speed, and no barge overflow. These measures can all be instrumental in reducing the amount of solids resuspended and therefore the extent of the area impacted by dredging.
- Silt curtains to protect sensitive habitats from resuspended solids.
- Environmental windows which restrict dredging or placement during fish migration and spawning periods.

Lists of possible BMPs are included in Chapter IV, Sections A and B.

C. Mixing Zones

A mixing zone is an area in a water body, defined by DEC, within which the Division of Water will accept temporary exceedances of water quality standards resulting from short-term

disruptions to the water body caused by dredging or the management of dredged material. A mixing zone can be assigned at the site of dredging, at the site of in-water placement of dredged material, and at the effluent discharge from on-water processing, on-land processing, and confined disposal facilities. (See Section A, preceding, for water quality limits that apply at the edge of any defined mixing zone).

In the case of contaminated sediment resuspended during dredging or dredged material management, disruptions to beneficial uses of the water-body must be minimized. The size and shape of mixing zones should be limited to ensure that they do not impair the integrity of the water body as a whole and that there is no lethality to organisms passing through or enveloped by the mixing zone (EPA Water Quality Standards Handbook - 2nd Edition - August 94). In addition, mixing zones should be established to provide a continuous zone of passage and to prevent any impairment to critical resource areas (EPA 94). Shallow water shorelines of rivers, lakes and the coast line, wetlands and biologically active zones should receive the greatest protection when establishing the limits of mixing zones (EPA 76).

To ensure protection of aquatic life when defining the allowable extent of a mixing zone, the following should be considered:

- Along shorelines, acute toxicity thresholds for suspended sediments should not be exceeded beyond a distance of 500 feet along the shore.
- In rivers and river-like sections of estuaries, acute toxicity thresholds for suspended sediments should not be exceeded beyond a distance of one third the width of the waterway or a total width of 500 feet, whichever is less.
- In open water areas of estuaries and lakes, acute toxicity thresholds for suspended sediments should not be exceeded beyond a distance which corresponds to 10% of the cross-sectional area of the waterway or a total width of 1500 feet, whichever is less.
- Wetlands, tidal creeks and other critical resources (e.g., water use areas or areas with abundant early life stages of fish or shellfish) must be protected from levels of suspended sediments that cause chronic toxicity. Permit review staff should delineate the size and shape of the chronic toxicity mixing zone to protect these resources.

For dredged material that has undergone suspended phase toxicity testing:

- The threshold of acute toxicity is estimated to be the suspended sediment (SS) concentration associated with 0.1 x the LC50.
- The threshold of chronic toxicity is estimated to be the suspended sediment (SS) concentration associated with 0.05 x the LC50.

For dredged material that has not undergone suspended phase toxicity testing:

- The threshold of acute toxicity is considered to be any SS levels 100 ppm above ambient conditions.
- The threshold of chronic toxicity is considered to be any SS levels 50 ppm above ambient conditions.

The Divisions may assign a default mixing zone of 500 feet (unless there is a critical water use area or sensitive habitat located closer than 500 feet) or require the applicant to provide a mixing zone analysis when whole sediment chemistry test results identify the presence of water quality limiting substances (Appendix A) or analytes at concentrations higher than the Class A threshold values or when sediment toxicity test results warrant. The analysis shall characterize the extent of potentially toxic water quality conditions that may result from remobilization of contaminants during dredging or management activities. This determination shall be made by the Divisions on a case-by-case basis and shall include consideration of the following:

- The nature of sediment contamination
- Proximity of sensitive habitats or water use areas (beaches, water intakes, etc.)
- Proximity of sensitive life stages of important biological resources.

Information such as sediment chemical and physical characteristics may be used to assess the potential impacts at the dredging or management site. Qualitative assessments which compare the proposed project to similar projects, for which field monitoring results are available, may also be considered.

1. Mathematical Models.

In some cases, mathematical models can be used to calculate contaminant or suspended solids concentrations at the boundaries of a defined mixing zone. If, based on characterization of sediments or whole sediment chemistry or toxicity tests, it is determined that the sediments are or have the potential to be toxic to aquatic life, then the Divisions may require the applicant to study the proposed dredge activity with the use of an appropriate model. The model should be used to determine whether predicted water quality conditions at the edge of the allowable mixing zone will comply with conditions in the 401 Certification or dredging permit. The applicant may choose to use an existing model or may have a model developed for the particular location.

Most of the existing sediment dispersion models are designed for the specific situations of open water disposal in the ocean, barge overflow, or return water from an upland disposal facility. These models are complex and have limits on their applicability. USACE Automated Dredging and Disposal Alternatives Management System (ADDAMS) models are available on the USACE web page and can be downloaded onto a personal computer.

The following guidelines apply to the use of mathematical models:

- If one of the existing mixing zone models is used (e.g. ADDAMS, CORMIX), then all input parameters and model runs should be provided to the Division of Water for review. If a new mixing zone model is developed for a particular site, the model and all documentation (including input parameters, model runs and analysis) should be provided to the Division of Water for review prior to acceptance of the predicted results.

! Some available models will predict concentrations of chemicals at the edge of the defined mixing zone. These predicted concentrations should be compared to the water quality standards (6NYCRR Parts 700-706) to ensure standards are not exceeded outside this mixing zone.

! Some available models will predict acute or chronic toxicity at the edge of the defined mixing zone. The predicted results should be compared to existing standards for toxicity.

! The predicted conditions at the boundary of the mixing zone should be evaluated based on proximity to sensitive habitats or water use areas.

! The model should be verified as appropriate for use in the particular flow situation. Some mathematical calculations for mixing can be used for steady state or non-complex flow conditions. However, tidally influenced rivers and estuaries are, by definition, complex flow conditions.

! The results of the model should be reproducible. A model cannot be used to predict conditions at the boundary of a mixing zone until it has been adequately calibrated.

! Model predictions should be verified by real-time sampling.

D. Monitoring Requirements.

A permit or certification for dredging and dredged material management may contain a number of performance requirements. If water quality monitoring is required to ensure compliance with these requirements, then the applicant, in consultation with the Divisions, should propose appropriate monitoring locations (including background sample location), action levels, and contingency requirements (i.e. corrective actions to be taken if monitoring reveals exceedances of water quality limits) for dredging and management operations, with final approval by the Divisions. The frequency and location of sample collection and the scheduled reporting of analytical results will be included in the permit and will be decided on a case-by-case basis. Monitoring may be biased toward a more intense monitoring effort during the early phases of a project. After consistent, satisfactory performance has been demonstrated, the Divisions would have the option of decreasing monitoring frequency. Any required field measurements or observations, including turbidity, should be reported to the Divisions within 24 hours. Sample analysis shall be undertaken at an environmental laboratory approved by the New York State Department of Health (ELAP). All laboratory results of analyses shall be transmitted to the Divisions electronically or by fax or overnight mail within ten working days of sample collection and immediately followed by a mailed copy. When the sediments to be dredged are highly contaminated, the permit may be conditioned to require a shorter turn around time for the transmission of required water column and/or effluent analysis results. This turn-around time shall be decided on a case-by-case basis. The permittee should identify any exceedances of the limit for suspended solids or of any other required monitoring parameter. The permittee should also include a description of the exceedance, its cause, and identify the corrective actions that were taken at the time of the exceedance. Typical monitoring requirements are as follows:

1. Total Suspended Solids

Total suspended solids concentrations may be measured directly through laboratory analysis, or a correlation may be derived for suspended solids and NTU. NTU may be measured in the field using one of a variety of available meters or sensors. An appropriate number of samples must be collected to make a statistical correlation between these two parameters.

- For dredged material that has undergone suspended phase toxicity testing, applicants should be required to measure the TSS and turbidity (NTU) of the full strength suspended phase and all dilutions tested. These measurements can be used to determine the turbidity in NTU associated with the acute or chronic toxicity levels established for the limits of any mixing zones. Turbidity in NTU may then be monitored in the field during any dredging or management operations.

- For dredged material that has not undergone suspended phase toxicity testing, applicants may be expected to collect a suspended phase sample of the dredged material, measure the TSS and turbidity, and determine if there is a correlation between the two measurements following the method in Thackston and Palermo "Improved Methods for Correlating Turbidity and Suspended Solids for Dredging and Disposal Monitoring" -1998. In accordance with this method, the applicant may be expected to provide the turbidity in NTU that is associated with TSS levels of 50 and 100 ppm above background.

2. Dredging Area

- The dredging area may be monitored for water quality parameters of concern (e.g., water quality limiting substances (see Appendix A) or substances identified at concentrations greater than Class A threshold values), for total suspended solids (TSS) at locations approved by the Divisions, or to ensure compliance with mixing zone limits. If a mixing zone limit was set using a mathematical model, TSS or turbidity monitoring requirements may be waived after real-time sampling verifies model predictions.

- The dredging area should be routinely inspected for compliance with general and special permit conditions for protection and restoration of habitat.

- The post-dredging sediment surface may be sampled and analyzed for sediment quality parameters and other contaminants of concern to assure that their concentrations do not exceed pre-dredging levels. This may be required if initial sampling and analysis of the sample segment representing the top six inches of the sediment to be exposed after dredging (see Chapter II, Section B.2.a) indicates an increased risk of contaminant exposure. See Application of Sampling Results (Chapter III, Section B.3) for options to prevent or limit exposure.

3. In-water/Riparian Placement Area

- In-water placement should be monitored for total suspended solids (TSS), settleable solids and other water quality parameters of concern (e.g., water quality

limiting substances (see Appendix A) or substances identified at concentrations greater than Class A threshold values) at locations approved by the Divisions.

- For any capped in-water placement area, physical inspections that are supplemented, if necessary, by bathymetric surveys should be conducted periodically and after major storm events to detect loss of cap integrity.

- For riparian diked sites or confined disposal facilities, overflow should be routinely monitored at the point of discharge (e.g. at the weir) for turbidity, total suspended solids, settleable solids and other water quality parameters of concern, to assess effectiveness of retention time for prevention of sediment and associated contaminant transport back into surface waters.

- For riparian diked sites or confined disposal facilities, the effluent plume should be visually monitored daily with periodic verification of total suspended solids concentrations. If there is a visible plume outside the mixing zone, the permittee should take action to rectify the situation. If there are water quality limiting substances in the dredged sediment or levels in the sediment at higher concentrations than Class A threshold values, the permittee may be required to monitor for these parameters at the edge of the mixing zone at the frequency deemed appropriate by the Divisions. Samples should be collected until there is no longer a discharge of effluent from the site or until the site has been modified to prevent further discharge to the waterway. The analytical laboratory quantitation levels for monitored parameters must be low enough to allow a meaningful evaluation of the concentration of the analytes.

E. Violations

Exceedance of state water quality standards may subject the permittee to a monetary fine, corrective or mitigation action, or other enforcement action by the Department.

Permits or certifications containing conditions with emission, discharge or other monitoring limits (i.e., for turbidity) should state that exceedances of such limits require that corrective measures be implemented immediately and a report e-mailed, faxed or overnight mailed to the appropriate Department personnel within 24 hours. For subsequent exceedances, the Certificate should require the permittee to immediately stop the activity causing the exceedances, and e-mail, fax or overnight mail notification to appropriate Department personnel within 24 hours. Such notification should contain a plan for corrective measures.

APPENDICES

APPENDIX A POTENTIAL WATER QUALITY LIMITING SUBSTANCES

Potential Water Quality Limiting Substances are substances that cause Water Quality Limiting Segments for different water bodies throughout the State. The definition of Water Quality Limiting Segments is as follows: "A designated portion of a water body where water quality does not meet applicable standards, or is not expected to meet applicable standards, even after the application of technology based treatment requirements by industry and secondary treatment by municipalities." This definition can be found in TOGS 1.3.1 - Total Maximum Daily Loads and Water Quality Based Effluent Limits.

Potential Water Quality Limiting Substances as of July 2001

For the Upper Hudson, Mohawk and Lower Hudson Basins, the following are potential or actual water quality limiting substances: mercury, copper, cyanide, iron, lead and PCB

For the St. Lawrence River PCB's and PAH's are water quality limiting substances.

For the Grass River cadmium, copper, cyanide, fluoride, iron, lead, sulfide, surfactants, zinc and phenols are water quality limiting substances.

For the New York Harbor mercury is water quality limiting and there is a fish advisory for PCB's. Other chemicals of concern are dioxin/furan's, PAH's and chlordane.

For the Genesee River Basin phenolics, chlorinated phenolics, cobalt, cyanide, hydroquinone, lead, 1,1,1-trichloroethane, dichlorobenzene, cadmium, tetrachloroethylene and copper are water quality limiting substances.

For the Lake Ontario Basin 1,1-dichloroethylene, 1,2-dichloropropane, dimethylaniline, ethylene glycol, acrylonitrile, bis-(2ethylhexyl) ether, 2,4-dichlorophenol and 2,6-dinitrotoluene are water quality limiting substances.

For the Allegheny River Basin copper, phenol and nickel are water quality limiting substances.

For the Lake Erie-Niagara River basin chrysene, benz(a)anthracene, hexachlorocyclohexane, PCB's, endosulfan, heptachlor, DDT, hexachlorobenzene and phenolics are water quality limiting substances.

For the Susquehanna River Basin - copper, cyanide, and iron are water quality limiting substances. In addition:

- Cadmium, lead, selenium and phenols are water quality-limiting downstream of Cortland.
- Cadmium is also water quality-limiting downstream of the Amphenol Corp. discharge at Sidney.
- Mercury is water quality-limiting downstream of the Binghamton-Johnson City STP.
-

For the Chemung River Basin - antimony, cadmium, copper, cyanide, lead, iron, and thallium are water quality limiting substances. In addition:

- Nickel, silver, zinc and fluoride are water quality-limiting downstream of the Toshiba, Westinghouse, Cutler-Hammer complex.
- Mercury, nickel, silver and zinc are water quality-limiting downstream of the Facet Enterprises hazardous waste remediation site on Mays Creek.

For the Seneca-Oneida-Oswego River basins cyanide, mercury, iron, aldrin, PCB's, dichlorobenzenes, and phenols are water quality limiting substances. In addition:

- Cadmium is water quality-limiting in the Onondaga Lake sub-basin while lead and trichloroethylene are water quality-limiting in the Ley Creek sub-sub-basin.
- Lead is water quality-limiting in the Owasco Lake sub-basin and in the Skaneateles Creek sub-basin.

APPENDIX B VARIOUS METHODS FOR CALCULATING HOW MANY SAMPLES SHOULD BE COLLECTED TO CHARACTERIZE A DREDGE SITE

Balduck's Method

The method of gridded sampling proposed by Balduck, 1992 (in Keillor 1993) may be used for dredge site characterization with certain modifications based on site size, dredge history, environmental flags (e.g., fish advisory), and the presence or absence of potential pollutants in the drainage basin or local environment. The Balduck equation considers the area (not volume) to be dredged and is used only to determine the number of sediment cores to be collected to provide spatially representative sampling of the dredge site. Core sample depth and segmentation guidelines are described in Chapter II, Section B.2.

Balduck's equation, modified for English units, is:

$$N=(Df)(30)((W)(L)(\frac{1}{1.2x10^6}))^{0.33}$$

where

N = the total number of coring (sampling) stations;

$\frac{1}{1.2X10^6}$ = factor to convert square yards into square kilometers;

W = the width (in yards) of a single dredge area or the widest dredge area where there are multiple areas to be dredged;

L = the length (in yards) of a single dredge area or the sum of the lengths of the parts of a combined dredge area;

Df = a dredge factor consisting of a multiplier (unitless) from 1 to 3 based on the site's dredging, environmental or pollutant history and other case-specific factors discussed below.

Table B-1: Balduck Method for Selection of Sample Size
Number of Samples for Analysis per Area (sq. yds.) to be Dredged

	Balduck Method		
Dredging Area (sq. yds.)	Number of Samples	Number of Samples	Number of Samples
	Df = 1	DF = 2	Df = 3
5,000 - 10,000	5 - 6	10 - 12	15 - 18
10,000 - 20,000	6 - 7	12 - 14	18 - 21
20,000 - 30,000	8 - 9	16 - 18	24 - 27
30,000 - 50,000	9 - 10	18 - 20	27 - 30
50,000 - 65,000	11	22	33
65,000 - 85,000	12	24	36
85,000 - 100,000	13	26	39
100,000 - 130,000	14	28	42
130,000 - 160,000	15	30	45
160,000 - 200,000	16	32	48
200,000 - 230,000	17	34	51
230,000 - 280,000	18	36	54
280,000 - 330,000	19	38	57
330,000 - 380,000	20	40	60
380,000 - 440,000	21	42	63
440,000 - 500,000	22	44	66
500,000 - 580,000	23	46	69
580,000 - 650,000	24	48	72
650,000 - 750,000	25	50	75
750,000 - 830,000	26	52	78
830,000 - 930,000	27	54	81
930,000 - 1,030,000	28	56	84

Df equals 1 for sites:

- with no previous sediment data; and
- no suspected likelihood of appreciable contamination.

Df equals 2 for sites:

- with no previous sediment data; but
- where there is a likelihood of contamination based on history of surrounding land uses (e.g., heavy industry), spills, observed environmental stresses; and dredging has occurred within the last five years; or
- near particularly sensitive features, e.g., water supply intakes, unique habitats.

Df equals 3 for sites:

- with documented contamination from past sediment data; or
- in areas of established fish advisories or spills or site-specific contamination of concern (e.g., copper, mirex, dioxin, PCB's) in the drainage basin; or
- where there is a likelihood of contamination and dredging has not occurred in the last five years.

NOTE:

Df of 0.5 where:

- previous data show no contamination.
- there is no likelihood of contamination.

SORENSEN

A Dutch formula for estimating sample density for conventional maintenance dredging was proposed by Sorensen (1984). The formula is as follows:

$$N = 3 + \left[\frac{(A^{0.5} * d^{0.33})}{50} \right]$$

where

N = number of cores
A = area (sq. Meters)
d = depth (meters)

ENVIRONMENT CANADA

An Environment Canada method for selecting the number of samples was presented by Macknight (1991). These guidelines call for calculating the dimensions of a sampling block (grid rectangle), using1000 cubic meters as a sampling block volume. For larger areas, this method calls for more samples than the other two methods. For small dredge areas, fewer samples would be suggested. The Canadian method calls for a sample in the center of each 1000 cubic meter block and is less random that the other two methods.

For more information on this method see: Mudrock A + S.D. MacKnight, 1991. Handbook of Techniques for Aquatic Sediments Sampling. pp.210. CRC Press, Boca Raton, FL.

APPENDIX C SEDIMENT SAMPLING

Table C-1 QC SAMPLES FOR SEDIMENTS			
Sample Type	**Purpose**	**Collection**	**Documentation**
Duplicate	Check laboratory and field procedures	1 sample per week or 10% of all field samples, whichever is greater	Assign two separate sample numbers, submit blind to the lab
Equipment (Rinseate) Blank	Check field decontamination procedures	Collect when sampling equipment is decontaminated and reused in the field.	Assign separate sample number
Matrix Spike and Matrix Spike Duplicate (MS/MSD)*	Required by laboratory protocols.	1 sample per twenty sediment samples	Assign both samples the same sample number. Indicate MS/MSD on chain-of-custody form.

*This is not necessary with PCB congener method or high resolution pesticide method or dioxin/furan analyses.

Table C-2 SAMPLE CONTAINERS AND VOLUMES FOR SEDIMENT SAMPLES		
Type of Analysis	**Type and Size of Container**	**Number of Containers and Sample Volume (per sample)**
Purgeable (Volatile) Organics	2-oz. glass jar with Teflon lined cap	Two; fill completely
Extractable Organics, Dioxin/Furan Pesticides/PCBs	8-oz. amber glass jar with Teflon-lined cap	One; fill completely
Metals	8-oz. glass jar with Teflon-lined cap	One; fill half full

Table C-3 SAMPLE PRESERVATION AND HOLDING TIMES FOR SEDIMENT SAMPLES		
Parameter	**Preservative**	**Maximum Holding Time[1]**
Volatiles	Cool to 4 C	7 days
PCBs/Pesticides	Cool to 4 C	Extract within 5 days, analyze within 40 days
Extractable organics	Cool to 4 C	Extract within 5 days, analyze within 40 days
Metals	Cool to 4 C	6 months
Mercury	Cool to 4 C	26 days
Dioxin/Furan	Cool to 4 C	Extract within 30 days, analyze within 1 year

[1] Holding times are based on verified time of sample receipt (VTSR). Source NYSDEC Analytical Services Protocol.

CHAIN OF CUSTODY RECORD

WORK ORDER #:
CUSTODY No:
PROJECT:
SAMPLED BY:
LOCATION:

SAMPLE NUMBER	DATE	TIME	SAMPLE LOCATION	MATRIX	COMPOSITE OR GRAB	FIELD MEASUREMENT	No. OF CONTAINERS	ANALYSIS REQUIRED							REMARKS (PRESERVATION, ETC.)

RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	RELINQUISHED by: (Signature)	DATE: TIME:	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	RELINQUISHED by: (Signature)	DATE: TIME:	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	SHIPPED / DELIVERED:	DATE:	TIME:
RELINQUISHED BY: (Signature)	DATE:	TIME:	RECEIVED BY: (Signature)	REMARKS:		
RELINQUISHED by: (Signature)	DATE: TIME:	TIME:	RECEIVED FOR LABORATORY BY: (Signature)			

Sampling Procedures

Core Samples

Sediment cores should be collected using a vibra-coring apparatus, or other appropriate coring device. Selected equipment is to be used in accordance with the manufacturer's instructions. Clean, decontaminated core tube liners must be used. The bottom of the coring tube liner should be immediately capped and taped upon removal of the coring apparatus from the water. The core tube liner should then be removed from the coring apparatus and its top immediately capped and taped.

The core tube liner and boat deck should then be rinsed with ambient water to reduce the risk of contaminated sediments becoming airborne as they dry.

A visual inspection of the sediment cores should then be performed. Individual horizons or strata within each core should be measured, along with the overall core length. These measurements and all significant features should be documented in a field notebook. The field notebook should also document the date, time, and location of each sample collected. Using a permanent marker, the date, time, and sample location should also be recorded on the sediment core tube liner. High resolution photographs of the cores may be taken.

The sediment core (or segment if appropriate) should be emptied into a clean tub and mixed with a clean spatula made of appropriate material. Generally sediment to be analyzed for trace metals should not come into contact with metals and sediment to be analyzed for organic compounds should not come into contact with plastics. When the sediment appears mixed to a uniform color and consistency, a clean scoop should be used to place the material into acid washed wide mouth glass jars with Teflon® lined screw lids. After a jar is capped and labeled, it should be immediately placed on ice in a cooler.

All sample containers should be labeled using a permanent marker to indicate the date, time, and sampling location. This information should then be recorded in a field log book and on a chain of custody form which will follow the samples. Sediment material not placed in sample bottles should be returned to the location from which it was collected. All sample bottles should be placed in coolers with ice and delivered to the laboratory via overnight delivery service.

Sediment Data Qualifiers

Qualifiers for Organics Analyses

Value	If the result is a value greater than or equal to the quantification limit, report the value.
U	Indicates compound was analyzed for, but not detected.
J	Indicates an estimated value.
N	Indicates presumptive evidence of a compound.
P	This flag is used for a pesticide/Aroclor target analyte where there is greater than 25% difference for detected concentrations between the two GC columns (see Form X). The lower of the two values is reported on Form I and flagged with a "P".
C	This flag applies to pesticide results where the identification has been confirmed by GC/MS.
B	This flag is used when the analyte is found both in the associated blank and in the sample.
E	This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.
D	This flag identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is re-analyzed at a higher dilution factor, as in the "E" flag above, the "DL" suffix is appended to the sample number on the Form I for the diluted sample, and all concentration values reported on that Form I are flagged with the "D" flag. This flag alerts data users that any discrepancies between the concentrations reported may be due to dilution of the sample or extract.

NOTE: These qualifiers do not apply to the PCB congener method 1668, but are applicable to the recommended PCB method 8082.

Qualifiers for Metals Analyses

B	The reported value is less than the Contract Required Detection Limit but greater than the Instrument Detection Limit.
U	The Analyte was analyzed for but not detected, i.e., less than the Instrument Detection Limit.
E	The reported value is estimated because of the presence of an interference.

Glossary of Selected QA/QC Terms
(source: NYSDEC ASP, 10/95)

Analytical Services Protocol (ASP) - the collection of analytical methods and corresponding reporting and quality control procedures that has been adopted by the Division of Water.

Contract Required Quantitation Limit (CRQL) - minimum level of quantitation acceptable under the ASP.

Equipment Rinseate - a sample of analyte-free media which has been used to rinse the sampling equipment. It is collected after completion of decontamination and prior to sampling. This blank is useful in documenting adequate decontamination of sampling equipment.

Field Blank - any sample submitted to the laboratory identified as a blank prepared in the field. The purpose of the field blank is to document whether or not there was contamination introduced in the collection of the sample.

Field Duplicates - an additional sample taken from the same homogenized sample and sent to the analytical laboratory for identical analysis.

Holding Time - the elapsed time, expressed in days, from the date of receipt of the sample by the laboratory until the date of its preparation (digestion, distillation or extraction) and/or analysis.

Matrix - the predominant material, component, or substrate (e.g., sediment) of which the sample to be analyzed is composed. Matrix is not synonymous with phase (liquid or solid).

Matrix Spike (MS) - aliquot of a sample fortified (spiked) with known quantities of specific compounds (target analytes) and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Matrix Spike Duplicate (MSD) - a second aliquot of the same matrix as the MS that is spiked with identical concentrations of target analytes as the MS, in order to document the precision and bias of the method in a given sample matrix.

Method Detection Limit (MDL) - the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

Minimum Quantitation Limit - the minimum level that an analyte can be quantitated within a specified precision.

Percent Moisture - an approximation of the amount of water in a sediment sample made by drying an aliquot of the sample at 105 °C. The percent moisture determined in this manner

also includes contributions from all compounds that may volatilize at or below 105 °C, including water. Percent moisture may be determined from decanted samples and from samples that are not decanted.

Practical Quantitation Limit (PQL) - is the lowest level that can be measured within specified limits of precision during routine laboratory operations on most effluent matrices.

Project - single or multiple data collection activities that are related through the same planning sequence.

Replicate - independent samples which are collected as close as possible to the sample point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently at the same laboratory. These replicates are used to characterize sediment heterogeneity.

Semivolatile Compounds - compounds amenable to analysis by extraction of the sample with an organic solvent. Used synonymously with Base/Neutral/Acid (BNA) compounds.

Tentatively Identified Compounds (TICs) - compounds detected in samples that are not target compounds, internal standards or surrogate standards. Up to 30 peaks (those greater than 10% of peak areas or heights of nearest internal standards) are subjected to mass spectral library searches for tentative identification.

Time - when required to record time on any deliverable item, time shall be expressed as Military Time, i.e., a 24-hour clock.

Trip Blank - a sample of analyte-free media taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures.

Validated Time of Sample Receipt (VTSR) - the date on which a sample is received at the laboratory facility, as recorded on the shipper's delivery receipt and chain-of-custody.

Volatile Compounds - compounds amenable to analysis by the purge and trap technique. Used synonymously with purgeable compounds.

Wet Weight - the weight of a sample aliquot including moisture (undried).

APPENDIX D TEQ CALCULATION FOR DIOXIN/FURAN

The 2,3,78-TCDD equivalent for a congener is obtained by multiplying the concentration of that congener by its Toxicity Equivalency Factor (TEF) from the table below. The TEQ is the sum of the products.

CONGENER	TEF
2,3,78 -Tetrachlorodibenzo-p-dioxin	1
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	0.01
Octachlorodibenzo-p-dioxin	0.001
2,3,7,8-Tetrachlorodibenzofuran	0.1
1,2,3,7,8-Pentachlorodibenzofuran	0.05
2,3,4,7,8-Pentachlorodibenzofuran	0.5
1,2,3,4,7,8-Hexachlorodibenzofuran	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.01
Octachlorodibenzofuran	0.001

TEQ calculation as per: NATO.1988. International Toxicity Equivalency Factors (I-TEF) Method of Risk Assessment for Complex Mixtures of Dioxins and Related Compounds. North Atlantic Treaty Organization. Report Number 176.

Known standards and guidelines are based on the method outlined above. In 1998 an expert meeting of the WHO was held to derive consensus TEF's for dioxins/furans and dioxin-like PCB's. A new list of TEF's was recommended which included values for humans, mammals, fish and birds. A copy of these numbers is available in:

Environmental Health Perspectives, December 1998. Toxic Equivalency Factors (TEFs) for PCB's, PCDD's, PCDF's for Humans and Wildlife. Volume 106, Number 12.

APPENDIX E SUM OF PAH'S

PAH’s in sum of PAH’s

Acenaphthene
Acenaphthylene
Anthracene
Benz(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
2-Chloronaphthalene
Chrysene
Dibenz(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-c,d)-pyrene
2-Methylnaphthalene
Naphthalene
Phenanthrene
Pyrene

The sum of the concentrations of these eighteen PAH analytes are used to calculate the sum of PAH for Table 2. If one or more analytes are missing from the list, sum the remaining analytes for the calculation of sum of PAH.

APPENDIX F BIOLOGICAL TESTING OF DREDGED MATERIAL

Although the Divisions do not routinely require biological testing, the Army Corps of Engineers (USACE) may require applicants to conduct a suite of biological tests to support their federal dredging permit application. If such test results are available and considered sufficient to characterize the material to be dredged, and especially if open water placement is planned, the Divisions may elect to use this information in lieu of or in addition to whole sediment chemistry analytical results to make permit decisions. The following sections describe biological testing and the application of test results.

A. Water Column (Suspended Phase) Evaluations

Federal dredging guidance requires preparation of a suspended particulate phase for bioassay testing with water column organisms. The suspended phase is the supernatant after 1 hour of settling following 30 minutes mixing of 1 part of sediment with 4 parts of dredging site water. Dilution series of 100, 50, 10 and 0% are prepared for the suspended phase toxicity tests to enable calculation of an LC-50 or EC-50 for three test organisms. The results of these toxicity tests can be used after applying mixing considerations and resource concerns at the dredging and placement sites. Water chemistry elutriate analyses are also conducted on a filtrate (0.45 um filter) of the suspended particulate phase to compare with water quality criteria. The results of both tests above are interpreted by USEPA/USACE using numerical modeling methods which simulate the hydrology and topography at the placement site. In federal determinations, the measured toxicity in the suspended phase has a 0.01 safety factor applied to calculate a Limiting Permissible Concentration (LPC), which is then applied in a mixing model to determine compliance with a 4 hour mixing zone at the placement site. For evaluations of dredging and placement operations, the LC/EC-50s and elutriate results can be applied by using a mixing zone analysis as described in Chapter V, Section C.

B. Benthic (Solid Phase) Evaluations

In federal dredging assessments, test results are compared to organisms exposed to a reference sediment for a designated placement site. Both the solid phase toxicity and bioaccumulation test results can be evaluated with regard to the potential for adverse impacts from newly exposed sediments at the dredge site, resettling of suspended solids at the dredge site, and at the in-water placement site.

i. Solid phase toxicity tests

When low reference survivorship is allowed to be used to evaluate the tests (a 20% difference from reference is allowed for amphipod test, and there is no established limit for reference survivorship), this should be considered in light of what would be an acceptable reference result for the dredging and placement sites. Significant toxicity in federal solid phase tests typically disqualifies dredged material from in-water placement. Disposal of such material within any State aquatic site would require positive placement, a comprehensive capping program and significant coordination. Any such project would be likely to require all available BMP permit conditions.

A lack of toxicity in solid phase tests does not itself automatically allow dredged material to be considered class A, as toxicity may still be demonstrated in the suspended phase or in the bioaccumulation portion of the solid phase tests. In addition, sediment quality thresholds may be exceeded to such an extent that the material cannot be confidently described as Class A.

The toxicity tests will be based on acute effects and follow EPA and ASTM standard methods. Using freshwater sediments, the test species should be *Hyalella azteca* and *Chironomus tentans* (ASTM Method E 1706). The endpoint for *Hyalella* is survival, while *Chironomus* is growth (weight) and survival. These species are recommended because they are widely used, easy to culture, and are highly tolerant to changes in grain size. The test should consist of five replicate samples for statistical comparison and be conducted in accordance with the standard methods. The results of the test should indicate whether the test sediments are statistically different from the reference sediment. ASTM (E 1383) provides ways to calculate these results.

For marine sediments, the acute toxicity bioassay test species should be the amphipod *Ampelisca abdita* (ASTM Method E 1367) and a polychaete *Neanthes arenaceodentata* (ASTM Method E 1611) or the mysid shrimp *Mysidopsis bahia*. Survival is the endpoint for these two species using the 10-day test. The results of these two tests should indicate whether the test sediments are statistically different from the reference sediment. ASTM (E 1383) provides ways to calculate these results. A solid phase chronic toxicity test using *Leptocheirus* has been developed by EPA. This test is outlined in "Methods for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-associated Contaminants with the Amphipod *Leptocheirus plumulosus* EPA/600/R-01-020, March 2001." Since this test is relatively new, it may not be cost effective for the applicant. However, the applicant has the option to use this chronic test to support the results of other biological tests.

These biological testing protocols are further detailed in a NYSDEC Division of Water document "Biological Assessment of Sediments in New York State - 1998".

ii. Solid phase bioaccumulation assays

Federal bioaccumulation testing for dredged material typically includes an extensive list of bioaccumulative contaminants of concern. Effects-based (ecological or human health) limits derived from scientific literature, as well as exposure considerations, are used to develop tissue guidelines. Divisions will need to consider any available field background tissue concentrations and exposure considerations for the dredging and placement sites to evaluate potential bioaccumulation impacts. To independently evaluate the toxicological aspects, literature values should be selected from studies that compared effects to *tissue* concentrations, as opposed to *exposure water* concentrations. For some contaminants, data for organisms that are as close as possible to, but not necessarily the same as the species at risk, will need to be used.

APPENDIX G GLOSSARY

GLOSSARY

ambient conditions - the conditions present at a given site based on chemical, physical and biological assessments.

anaerobic - able to live, and grow in the absence of free oxygen.

baffle - a device (as a plate, wall or screen) to deflect, check, or regulate flow.

beneficial use - material being used beneficially pursuant to section 6 NYCRR Part 360-1.15 and removed from the definition of a solid waste, and therefore the jurisdiction of Part 360, as per 6 NYCRR Part 360 - 1.2(a)(4)(vii).

benthic - of, relating to, or occurring at the bottom of a water body; relating to sediments.
benthos - organisms that live on or in the bottom of a water body.

best management practices (BMPs) - methods and measures employed during dredging or dredged material management to minimize adverse environmental impacts.

bioaccumulation - the progressive increase in the amount of a chemical in an organism through any route including respiration, ingestion, or direct contact with sediment or water.

borrow pit - an excavated area where material has been dug for use at another location.

confined disposal facility - for the purposes of this TOGS, a diked area, either in-water or in a riparian area, used to contain dredged material.

containment area - any location or site used for the permanent or temporary placement of dredged material which may or may not have structures designed to prevent contact with water or terrestrial environment.

data qualifier - a word or symbol that limits or modifies the meaning of analytical results.

dewatering - the practice of removing water from a waste product or dredged material , which can be performed actively or passively.

dioxin - a toxic chlorinated hydrocarbon which occurs as an impurity in the herbicide 2,4,5-T.

dredging - for the purposes of this document the term dredging includes all in-water activities designed to move or remove sediment. Examples of such activities include but are not limited to mechanical and hydraulic dredging, mechanical plowing, trenching and jetting.

dredged material - the sediments under a body of water removed during a dredging operation and displaced or removed to a management location.

effluent - waste material discharged into the environment, especially when serving as a pollutant; applies to the water discharged over the weir of a confined disposal facility for dredged material or from a dredged material dewatering facility.

fines - sediment (silt and clay) that passes through the 200 U.S. standard sieve mesh or material with a grain size of 0.0625 mm or less.

guidelines - are published in TOGS and other internal documents but do not have the force and effect of a law.

guidance - refers to either national or regional implementation manuals developed to assist the evaluator in making technical decisions.

hazardous waste - any material meeting the definition of a hazardous waste as defined in 6NYCRR part 371.

homogenize (as in *sample homogenization*) - to make more uniform throughout in texture, mixture, quality, etc. by breaking down and blending the particles.

hydraulic dredging - removing sediment from the bottom of a water body or the sea with the use of suction equipment.

interstitial - referring to the interstices, or pore spaces in rock, soil, or other material subject to filling by water.

littoral - a coastal region; the shore zone between high and low watermarks.

loading - the quantity of a material or substance entering a system.

mixing zone - the area in a water body where a temporary exceedances of water quality standards resulting from short-term disruptions to the water body caused by dredging or the placement of dredged material will be accepted.

modeling - a system of postulates, data, and inferences presented as a mathematical description to both describe and predict a system which can not be easily observed.

navigable waters (of the State) - (NY State definition) means all lakes, rivers, streams and other bodies of water in the State that are navigable in fact or upon which vessels with a capacity of one or more persons can be operated notwithstanding interruptions to navigation by artificial structures, shallows, rapids or other obstructions, or by seasonal variations in capacity to support navigation. It does not include waters that are surrounded by land held in single private ownership at every point in their total area.

navigable waters - (EPA definition) means the waters of the United States, including the territorial seas.

outfall - the mouth of a drain or sewer.

parameter of concern - a substance that exceeds a threshold value for assessment.

persistent - refers to the transformation half life of a chemical in the environment (EPA defines as greater than 6 months in soils and sediment).

polychlorinated biphenyls (PCBs) - one of several aromatic compounds containing two benzene nuclei with two or more substituent chlorine atoms. They are colorless, toxic, viscous liquids. Because of their persistance and ecological damage from water pollution, their manufacture has been discontinued in the US (1976).

polycyclic aromatic hydrocarbons (PAHs) - hydrocarbons are an organic compound consisting exclusively of the elements hydrogen and carbon. Polycyclic hydrocarbons are made up of four or more ring structures. Aromatic refers to their strong and not unpleasant odor. PAH's are derived principally from petroleum and coal tar sources and some have demonstrated carcinogenic properties.

protected stream - means any stream or particular portion of a stream for which there has been adopted by the Department or any of its predecessors any of the following classifications or standards: AA, AA(t), A, A(t), B, B(t) or C(t). Streams designated (t)(trout) also include those more specifically designated (ts)(trout spawning).

riparian - land areas directly influenced by a body of water; usually pertains to the banks of a river, stream, or waterway that have visible vegetation or a physical characteristic showing influence by a water body. For the purpose of this TOGS is defined as the 100 year flood plain plus any adjacent wetland integral to the surface water (U.S. vs. Riverside Bayview Homes, Inc., 474 U.S. 121, 106 S. Ct. 455 (1985).

riparian diked site - see confined disposal facility.

silt - loose sedimentary material with rock particles measuring 4 to 62.5 micrometers in diameter.

sediment quality criteria - numeric, effects-based concentrations that provide an interpretive tool to relate ambient sediment chemistry data to potential adverse biological impacts.

standard - form the legal basis for controls on the amount of pollutants entering the environment from various sources.

stratification (of sediments) - the formation of distinct layers of sediments having the same general composition (grain size, quality), arranged one on top of another.

substrate - the base on which an organism lives.

surfactant - a compound that reduces surface tension (as a detergent).

Toxicity Characteristic Leaching Procedure (TCLP) - A test that measures the mobility of organic and inorganic chemical contaminants in wastes (see - SW846 method 1311).

Total Organic Carbon (TOC) - the amount of carbon covalently bound in organic compounds.

upland - beyond the FEMA designated 100 year flood plain.

weir (controlled outlet weir) - structure which raises the water level or diverts water flow.

wetlands - under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

freshwater wetlands -(NYSDEC definition) - "Freshwater wetlands" or "wetlands" means lands and waters of the state which meet the definition provided in subdivision 24-0107(1) of the Freshwater Wetlands Act and have an area of at least 12.4 acres (approximately 5 hectares) or, if smaller, have unusual local importance as determined by the Commissioner pursuant to subdivision 24-0301(1) of the Freshwater Wetlands Act and 6NYCRR Part 664.

tidal wetlands -(NYSDEC definition) , Generally, tidal wetlands or wetland shall mean any lands delineated as tidal wetlands on an inventory map and shall comprise the following classifications as delineated on such map: Coastal fresh marsh; intertidal marsh; coastal shoals, bars and flats; littoral zone; high marsh or salt meadow; or formerly connected tidal wetlands. Tidal wetlands are more fully defined in ECL §25-0103(1) and its implementing regulations.

whole sediment chemistry - the analytical quantification of target analytes in sediments being dredged or proposed for dredging.

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APPENDIX D:
Supply List for Iron Point Sediment Sampling

SUPPLY LIST FOR SEDIMENT SAMPLE COLLECTION:

Multi-stage sediment sampler (AMS Inc., American Falls, Idaho)

AMS soil sample liners (AMS Inc. American Falls Idaho)

Sample Containers (obtained from analytical laboratory at least one day prior to sample collection date)

Pre-completed sample labels (Labels shall be obtained from analytical laboratory and completed prior to sample collection to ensure cleanliness and legibility of labels. Only time of sample collection should be added to pre-completed label after sample collection).

Chain of Custody forms (obtained from analytical laboratory and completed prior to sample collection to ensure legibility and cleanliness of COC forms. Only time of sample collection should be added to pre-completed COC form after sample collection).

Clear Transparent Polypropylene Envelope File Folders with String-Tie Closure to store/protect pre-completed labels and COC forms

Large laboratory spatulas.

(2) 5 gallon plastic buckets. One for sample homogenization and one for sampling equipment decontamination.

Phosphate-free laboratory detergent (Liquinox by Alconox (Jersey City, NJ) or equivalent)

Long-handled scrub brushes.

24" Bottle brush.

Minimum of 3 gallons of clean tap water

6 ft x 8 ft woven poly tarp.

Nitrile gloves (1 box per sampling event).

48-QT cooler and three 10lb bags of ice.
Field notebook and pens/permanent markers.
Field references/guides (Munsell Soil Color Chart and USDA Field Book for Describing and Sampling Soils).

Notes:

1. All equipment unless otherwise noted shall be stored and maintained at Land Use Ecological Services office at 570 Expressway Drive South, Medford NY 11763 and maintained by William P. Bowman.
2. Soil sampling is necessary for Iron Point Wetland Restoration project.

APPENDIX E:
Sample Field Data Forms

Channel Reconnaissance Form

Date				
Stream/Drainage				
Stream Reach ID				
Field Team		**Station**		**To**

General Channel Conditions

Channel Shape (check)
- ☐Rectangular
- ☐Shallow Rectangular
- ☐Irregular
- ☐Trapezoidal
- ☐Parabolic
- ☐Other _____

Sediment Particle Size Estimate	
Banks	
Bars	
Bed	

Bar Types: ☐Alternate lateral ☐Point / transverse ☐None ☐Mid-channel ☐Point / mid ☐Point / alternate

Fluvial Geomorphic Conditions

Vertical Stability *degradation/aggradation*					
Lateral stability *deposition, erosion*					
Erosion (excessive/site specific)					
Dominant bank erosion types (circle any that apply)	*Fluvial*	☐Undercut / cantilever	☐Selective erosion of noncohesive laters	☐Dry flow	☐Seepage
	Gravitational	☐Rotational	☐Planar	☐Wedge	
Bank composition	*Notes (shape/character)*:				
Terrace/Valley	*Valley form –*		*Land Use –*		
Altered state (human) - dams, bridges, canoe landings, parks, etc.					
Bankfull/Channel forming flow indication					

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Sediment Impacts			
Riffle sediment type		Pool sediment type	
Sorting / Imbrication			
Bars / depositional features			
Sediment type/size			
Mid, alternate, braided			
Bar Vegetation (type, age)			
Floodplain soils			
Overbank deposition			

Riparian Vegetation and Floodplain

Root coverage of banks (%)	
Width of veg. riparian corridor*	
Canopy coverage (%)	

** Verify with orthoquad data*

Canopy structure : (check one)

none = anthro / maintained (lawn, field, pasture)	
low = single canopy layer	
medium = at least two canopy layers	
high = multiple canopy layers	

Primary veg forms present: (%)		Woody Species present	% of total tree community
grasses/forbs			
woody species			
bare/other			
Exotic/invasive species			

Tree Stand Age (if applicable)

Station	*Species*	*Age*	*Notes / Location within XS*

Riparian Landuse

General Riparian Notes:

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Channel Stability Form

Reach stability		**1-2 Degrading**		**3 Stable**		**4-5 Aggrading**
Estimated sediment mobility (D50 moves at:)	<2yr Q		2-10 yr		>10 yr	
Substrate consolidation	Strong, gravels/cobble		Strong, gravels		Weak, sand/silt	
Bank failure mechanism	High banks, grav. collapse, variable channel width		Localized surficial erosion, constant width		Low banks, overflows, surficial erosion	
Bar development	Poorly formed		Narrow, vegetated		Wide (>1/2 channel length), unveg.	
Bank erosion extent	Extensive		Local erosion/pools		Extensive bar pressure	
Relative Width:Depth ratio	Low		Average		High	
Channel pattern	Single thread		Single thread		Multiple thread/braided	
Average bank slope	<3:1		>3:1			
Vegetative bank protection	Poor		Extensive		Poor	
Field stability rating (add all cells)/9		**=**				

Representative cross-section sketch		
Bankfull width = Bankfull depth =	Floodplain width =	Water depth (at survey) = Water width (at survey) =
Station:		
Station:		

GENERAL REACH NOTES

POTENTIAL PROJECTS

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Photos

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WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: _____ City/County: _____ Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: _____

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** _____ If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? **Yes** _____ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: _____

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks: