New York State Department of Environmental Conservation
**Division of Water**
**Bureau of Water Assessment & Management**
625 Broadway, Albany, NY 12233-3502
**Phone:** (518) 402-8289 **Fax:** (518) 402-9029
**Website:** www.dec.state.ny.us/dow/bwam.html

Erin Crotty
Commissioner

# Division of Water

## Technical & Operational Guidance Series (TOGS) 5.1.9

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## 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

## TABLE OF CONTENTS

I. INTRODUCTION ..... 1
A. Discussion ..... 2
B. Required Approvals ..... 3
C. Jurisdictional Considerations ..... 5
D. Application Process ..... 5
1. Description of Application Process and Technical Review ..... 6
2. Applicant Requirements for Description of Dredging Projects ..... 8
II. SEDIMENT QUALITY PARAMETERS AND SAMPLING REQUIREMENTS ..... 10
A. Chemical Selection ..... 12
B. Sampling and Analysis Requirements ..... 15
1. Sampling Exemptions ..... 15
2. Collection of Samples to Characterize Sediment ..... 15
III. EVALUATION OF RESULTS ..... 19
A. Sediment Quality Thresholds For In-water/Riparian Placement ..... 20
1. Class A - No Appreciable Contamination (No Toxicity to aquatic life). ..... 20
2. Class B - Moderate Contamination (Chronic Toxicity to aquatic life). ..... 20
3. Class C - High Contamination (Acute Toxicity to aquatic life). ..... 20
B. Application of Sampling Results ..... 24
IV. GENERAL GUIDELINES FOR DREDGING AND IN-WATER AND RIPARIAN MANAGEMENT OF DREDGED MATERIAL ..... 26
A. General Dredging Guidelines ..... 27
1. Environmental Objectives for Dredging ..... 27
2. Best Management Practices ..... 27
B. General Guidelines for In-Water and Riparian Management of Dredged Material 29
1. Environmental Objectives for Dredged Material Management at Riparian and/or In-water Sites ..... 29
2. Design Consideration for Riparian Confined Disposal Facilities ..... 31
V. PERMIT CONDITIONS FOR DREDGING AND DREDGED MATERIAL MANAGEMENT ..... 33
A. Water Quality Based Limits and Technology Limits ..... 34
B. Best Management Practices. ..... 35
C. Mixing Zones ..... 35
1. Mathematical Models. ..... 37
D. Monitoring Requirements. ..... 38
1. Total Suspended Solids ..... 38
2. Dredging Area ..... 39
3. In-water/Riparian Placement Area ..... 39
E. Violations ..... 40
APPENDICES ..... 41
APPENDIX A POTENTIAL WATER QUALITY LIMITING SUBSTANCES ..... 42
APPENDIX B VARIOUS METHODS FOR CALCULATING HOW MANY SAMPLES SHOULD BE COLLECTED TO CHARACTERIZE A DREDGE SITE ..... 45

APPENDIX C SEDIMENT SAMPLING ........................................................................ 49
APPENDIX D TEQ CALCULATION FOR DIOXIN/FURAN......................................... 57
APPENDIX E SUM OF PAH'S .............................................................................. 59
APPENDIX F BIOLOGICAL TESTING OF DREDGED MATERIAL............................. 61
APPENDIX G GLOSSARY ................................................................................... 64
References .......................................................................................................... 69

## LIST OF TABLES

Table 1 Method Detection Limits and Suggested Analytical Methods........................... 14
Table 2 Sediment Quality Threshold Values for Dredging, Riparian or In-water Placement........................................................................................................... 21
Table 3 RIPARIAN/IN-WATER Management Options ................................................. 23
Table 4 Section 703.2 Narrative Water Quality Standards........................................... 34

# 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. <u>Cost Reduction Strategies</u>. 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. <u>Quality Assurance and Quality Control</u> 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 <u>must</u> 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. <u>Design Consideration for Riparian Confined Disposal Facilities</u>

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<br>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<br>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. <u>Mathematical Models.</u>

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. <u>Dredging Area</u>

- 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. <u>In-water/Riparian Placement Area</u>

- 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.

<u>Potential Water Quality Limiting Substances as of July 2001</u>

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<br>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<br>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<br>SAMPLE PRESERVATION AND HOLDING TIMES<br>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.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| RELINQUISHED BY: (Signature) | DATE: | TIME: | RECEIVED BY: (Signature) | RELINQUISHED by: (Signature) | DATE: | TIME: | RECEIVED BY: (Signature) |
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| 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:<br>TIME: | TIME: | RECEIVED FOR LABORATORY BY: (Signature) | | | | |

Sampling Procedures

<u>Core Samples</u>

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. |

**<u>Glossary of Selected QA/QC Terms</u>**
**(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 <u>not</u> 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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