Sampling and Analysis Plan – Private Dredging
USACE Galveston District

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1.0 OBJECTIVES

The objectives of this maintenance dredging application and testing are:

a) Collect sediment samples which adequately characterize the project dredged materials for maintenance dredging project as described below in Section 2;
b) Analyze the dredged material samples chemically and physically in order to provide information to determine if the sediments are contaminated;
c) Document the field sampling and results of physical and chemical analyses and quality control measures;
d) Collect sufficient data to determine whether unacceptable adverse impacts would result from dredging and dredged material placement operations (upland placement or open water).

2.0 OVERVIEW

For all third party dredging projects:

a) The entire costs of testing, evaluation, and reporting under these guidelines will be paid for by the applicant and should be conducted by qualified firms;
b) The applicant will provide information regarding the volume of dredged material, dredging and disposal methods, scale drawings indicating the dredging location(s), disposal area(s), and sample locations;
c) Dredged material samples shall be selected to be representative of dredge footprint materials;
d) Coordination and review of the dredging project approach by the Galveston District is strongly recommended before plans are implemented.

3.0 APPROACH

Site water and sediment samples will be collected from the Applicant's dredge site for the purpose of conducting testing to characterize the material that will be excavated during the maintenance dredging project. Sampling locations will be selected such that the sediment collection locations are evenly distributed over the dredge footprint, with bias towards areas of highest usage and activity. Testing requirements will depend upon the history of the site, the surrounding area, past dredging information and the placement options desired by the applicant. Data needed for the evaluation will consist of chemical analyses of sediment, water, and elutriate samples. Collection of the physical parameters required includes grain-size analyses, percent solids, pH, temperature, and salinity. In limited instances, bioassays such as toxicity, survival and bioaccumulation would be needed to determine suitability of material prior to placement. The applicant is responsible for contacting the US Army Corps of Engineers, Galveston District (Galveston District) to determine whether or not special requirements exist for your project area and if modifications to this testing protocol are required. The applicant shall contact Ms. Lisa Finn (Lisa.M.Finn@usace.army.mil) and Ms. Emily Drastata (Emily.A.Drastata@usace.army.mil) in order to obtain approval of their Sampling and Analysis Plan prior to testing.

Previously constructed projects that require dredging to previously authorized depths will be classified as maintenance projects as opposed to virgin cuts that would be classified as new work projects. However, if a lengthy time has passed between dredging events or a substantial amount of material has accumulated, a more stringent protocol for testing may be required to adequately assess the material to be removed. An example would include a basin that has been abandoned for 20 years. The Galveston District reserves the

right to determine the appropriate protocol to be utilized based on the site conditions.

Sampling of dredged material will be required prior to the start of every dredging event. Data will be valid for a two-year period from the time of sampling.

The applicant is directed to four primary resource documents for background:

a) USEPA and USACE (1998). Evaluation of Dredged Material Proposed for Discharge in Waters of the US - Testing Manual. Inland Testing Manual ("ITM");
b) USACE (1995). QA/QC Guidance for Sampling and Analysis of Sediments, Water and Tissues for Dredged Material Evaluations (Chemical Evaluations). EPA-823-B-95-001;
c) USACE (2003). Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities – Testing Manual;
d) US EPA and US Army Corps of Engineers (2003). Regional Implementation Agreement (RIA) for the Ocean Dredged Material Disposal Program. US EPA Region 6 and US Army Corps of Engineers, Galveston District. July 2003.

4.0 SAMPLE COLLECTION

4.1 Overview

All sample collections and chemical analyses will be conducted according to appropriate existing standard procedures. The following sections provide a synoptic overview of factors to consider during sample collection. The Applicant should consult with their analytical provider to ensure sufficient sample volumes are collected to meet both project and quality control requirements (Section 5.2 (d) and (g)).

4.2 Sample Sites

Sample collection must be accomplished by qualified personnel at the agreed upon locations that have been selected to be spatially representative of the material to be dredged. Samples will be taken at representative locations; locations will be selected such that the sediment collection locations are evenly distributed over the dredge footprint, with bias towards portion areas of highest usage and activity. To ensure that representative maintenance dredged materials are sampled, sample locations where depths are already at or below project depth will not be selected. Recent bathymetry survey data (collected within the last 2 years) should be utilized in choosing sample locations.

Sampling frequency and sampling technique will be determined by the volume of dredged material. For projects with volumes up to and including 30,000 cubic yards (CY), a minimum of three (3) ponar grab samples, one (1) surface water and one (1) elutriate sample will be collected. For larger volume projects (>30,000 CY) an additional one (1) grab sample will be collected for every 20,000 for a minimum of 4 grabs, 2 surface water and 2 elutriate. Projects larger than 100,000 CY will be dealt with on a case-by-case basis and may require coordination with the USACE to determine the most appropriate sample frequency. Composite samples are ONLY acceptable at individual sample locations if multiple grabs are required to obtain sufficient volume. Debris will be discarded from the sample but will be done in such a manner as to not compromise or change the nature of the sample so that it remains representative of the location. All appropriate sample disposal methods should be used while sampling.

The applicant must know in advance of field collection what samples and what volumes or depths of samples are to be collected. The applicant is directed to contact their analytical provider to ensure that sufficient sample volumes are collected for both project samples and field QC (see Section 5.2 (d) and (g)). Compliance with these procedures shall be documented in the field. If the samples cannot be collected at the specified location, the position will be adjusted the least amount possible, to meet all requirements. Satellite positions of each collection site will be recorded and reported on the field data sheets.

Table 1 provides a generic example of how to summarize proposed sampling:

a) Each sample will be assigned a unique identifier;
b) Each sample will have precise GPS coordinates recorded;
c) Environmental media (surface water, sediment) to be collected at each location will be indicated;
d) Nature of the sample (e.g. composited because grabs were required to obtain sufficient volume or not composited) will be indicated;
e) Tests and analyses to be run for each sample will be indicated;

Figures 1A and 1B provide examples of dredge footprints with sampling locations. The figure must clearly indicate the area to be dredged and the sample locations within this area so that sample representativeness can be evaluated. Figure 1A shows a reach, while Figure 1B shows a basin and bank removal. For bank removal or smaller areas, hatching must be added as on overlay layer so that the distribution of the sampling locations over the proposed dredging footprint can be seen. Samples and analyses must be representative of the dredge area both chemically and spatially and be consistent with surrounding land use history and site usage history.

4.3 Water Samples

Prior to sample collection, all containers and sampling equipment will be cleaned according to protocols described in Plumb (1981), or other appropriate guidance manuals cited in Section 4.1. Care must be taken to avoid contamination to sampling devices from the boat deck, or other surfaces. Powderless latex or nitrile gloves shall be worn during sample collection and sample handling.

Water samples are to be collected using a suitable non-contaminating pump, such as a metal-free bilge pump. Food-grade hoses, dedicated on a per sample basis, will also be used. The initial pumped water equaling AT LEAST FIVE TIMES THE HOSE VOLUME will be discarded. It is recommended that water be collected from the approximate middle of the water column. The water sample will then be collected into laboratory supplied pre-cleaned bottles. Polyethylene or glass bottles with appropriate acid preservatives will be used for metals analyses. Also, water samples to be analyzed for metals, other than mercury and selenium, will be filtered through a clean 0.45µm filter prior to dispensing into containers with acid preservatives. TPH water samples that are to be analyzed by TCEQ Method 1005 may also be filtered through a clean 0.45 µm filter prior to dispensing into containers with appropriate preservatives. Water samples to be analyzed for mercury and selenium only must not be filtered AT ALL prior to dispensing into containers with acid preservatives. Pre-cleaned brown glass bottles will be used for organics analyses. Bottles will be filled completely, avoiding the presence of any air bubbles in the sample bottle.

Field data will be described as collected at the time of sampling, including but not limited to: date, time, water depth, station (or sample) name and GPS coordinates.

For sites with dredged material volume less than 30,000 CY, one (1) site water sample will be collected. For larger sites, one (1) water samples will be collected for every additional 20,000 CY, with a minimum of 2. Water samples will also undergo chemical analysis and will be compared to the elutriate data.

4.4 Sediment Samples

Prior to sample collection, all containers and sampling equipment will be cleaned according to protocols described in Plumb (1981), or other appropriate guidance manuals cited in Section 4.1. Care must be taken to avoid contamination to sampling devices from the boat deck, or other surfaces. Powderless latex or nitrile gloves should be worn during sample collection and sample handling. Sediment samples will be collected by ponar, core, or dredge, as determined by the depth of material to be dredged and approved by Galveston District.

Effort will be made to sample "least contaminated" material first in order to minimize cross contamination of samples by sampling equipment. Equipment must be cleaned (decontaminated) between sample locations to minimize cross contamination possibilities. Direct body contact with the samples will be avoided.

At each sample station, the water depth to the top of sediment will be determined. This may be done using a fathometer, lead line, or other depth-measuring device. Depths recorded must be corrected to MLT or applicable local datum either through the use of a tide gauge or tide table.

Prior to collection at each sample site, the ponar shall be rinsed with deionized water, then ambient water. The sample shall then be collected and deposited into a clean stainless steel pan. The sediment sample will be characterized. If multiple grabs are required at an individual sampling location to obtain sufficient volume, the individual grabs for that location (and only that location) will be composited and mixed thoroughly to homogenize prior to subsampling. Site-wide composition of samples is not permitted without presentation of and concurrence with a technically defensible rationale by the USACE in advance of sampling.

Using clean stainless steel equipment, the sample that is to undergo chemical analyses will be homogenized (i.e. mixed thoroughly) and then placed into a laboratory provided pre-cleaned glass jar with preservatives, if required for the type of analysis. The jar is to be completely filled so as to avoid head space. The lid will be tightly secured, and the sample jar placed into an ice chest, containing sufficient cushioning material to prevent breakage.

Field data will be described at the time of sampling and will include but not be limited to: date, time, water depth adjusted to MLT, sample appearance, odor, stratification, texture, salinity, water temperature, pH, GPS coordinates (easting/northing), and photos.

For projects with volumes up to and including 30,000 cubic yards (CY), a minimum of three (3) grab samples will be collected. For larger volume projects (>30,000 CY) an additional one (1) grab sample will be collected for every 20,000 CY for a minimum of 4 grabs. Composite samples are ONLY acceptable at individual sample locations if multiple grabs are required to obtain sufficient volume. Debris will be discarded from the sample but will be done in such a manner as to not compromise or change the nature of

the sample so that it remains representative of the location.

Sediment from all the samples collected will be homogenized into one representative sample to be used as the sediment for the elutriate test. **The applicant is strongly advised to contact their analytical provider to confirm sample volume requirements are met for all analyses**.

4.4.1 Bulk Samples

No samples will be taken from areas already at or below project depth. All samples will be retrieved and examined for appearance, odor, horizons etc. Multiple samples may need to be taken at an individual sampling location to obtain sufficient volume; should this circumstance arise, samples will be taken and composited until sufficient sample volume for all analyses has been retrieved. The sample will be thoroughly mixed so as to be homogenized before material for individual analyses is taken.

4.4.2 Elutriate

For projects up to and including 30,000 CY, one standard elutriate test will be performed for the site. For projects greater than 30,000 CY, one additional elutriate sample will be collected for each additional 20,000 CY or part thereof. Site water will be collected to facilitate the mixing for this test.

4.4.3 Bioassay Samples

If water quality standards are exceeded in the elutriate sample(s), toxicity testing may be required.

4.5 Sample Preservation and Storage

A suitable method for preservation and shipment of water and sediment samples must be used and documented. USEPA SW-846 provides guidance as do the references cited in Section 4.1. Immediately after collection, the samples must be stored at 2°C to 4°C, never frozen. Analyses are to be performed within the recommended holding times, as described in the referenced guidance documents. The applicant should verify and confirm all sample handling, storage and preservation requirements with the analytical facility performing their project analyses. Table 2 summarizes recommended procedures for sample collection, preservation and storage.

4.6 Chain of Custody

Appropriate Chain of Custody protocols will be followed. Guidance can be found in the references cited in Section 4.1 as well as Plumb (1981). Applicants shall discuss chain of custody forms with the analytical facility performing their project analyses.

5.0 ANALYSES

5.1 Physical and Chemical Analyses

Each of the samples shall undergo the analyses agreed upon with Galveston District; these samples would at a minimum be 3 bulk sediment, 3 grain-size, 1 water and 1 elutriate sample with the potential for bioassays, if required. All analyses must be performed within the holding period described in the referenced guidance documents and outlined in Section 3.5 (see also Table 2). Sediment sample data will be reported as dry weight.

All chemical analyses shall be performed by a qualified laboratory (NELAP or similar accreditation).

In order to simplify and streamline the application process, COCs have been divided into two categories: (1) common COC and parameters and (2) special land use/history COCs and parameters. It is the expectation of the Galveston District that most third party dredging applicants will fall into the first category; however, justification such as previous dredging analyses results, land use etc. must be provided to support the contention that the special list of analytes does not apply to your application. Common COCs and parameters to be analyzed in each medium (surface water/elutriate, sediment, soil) along with target detection limits (TDLs) and/or screening criteria/benchmarks are listed in Tables 3 through 6; Tables 7 through 10 present similar information for special land use/history COCs and parameters.

The applicant will discuss which analytical method will achieve the required target detection limits with the laboratory responsible for performing their analyses and must document and justify the analytical method utilized in the testing report produced for this project. Tables 3 through 10 provide suggested methods but any analytical method performed by a laboratory accredited by an accrediting authority recognized by the National Environmental Laboratory Accreditation Program (NELAP) is acceptable, provided the TDLs are less than the most stringent criteria.

For chlorinated pesticides in water, USACE recognizes that the listed TDLs may be difficult to reach; however, the applicant and their analytical provider must attempt to meet them. If in spite of best efforts, minor exceedances of these TDLs are noted for analytes in either surface water or elutriate analyses, USACE SWG will initiate a more detailed review of chlorinated pesticide sediment data before making a final decision on the suitability of the sediment for placement. Additional details regarding the use of screening benchmarks can be found below in Section 5.3, as well as the Galveston District's Private Marine Dredging Application Report Outline Guidance document.

5.2 Laboratory Quality Control

The Laboratory Quality Control program must include, but not be limited to:

a) Accreditation Status - The laboratory shall have current accreditation status, consistent with standards adopted by the National Environmental Laboratory Accreditation Conference (NELAC);
b) Method Blanks - Shall be performed at a frequency of one per batch of samples, per matrix type, per sample extraction or preparation method;
c) Laboratory Control Samples – Shall be analyzed at a minimum of 1 per batch of 20 or less samples per matrix type, per sample extraction or preparation method, except for analytes for which spiking solutions are not available;
d) Matrix Spikes – Shall be performed at a frequency of 1 in 20 samples per matrix type, per sample extraction or preparation method, except for analytes for which spiking solutions are not available. The spike concentration shall be no greater than 25% to 50% of the maximum concentration along the linear segment of the instrument calibration curve for any analyte;
e) Matrix Spike Duplicates – Shall be analyzed at a minimum of 1 in 20 samples per matrix type, per sample extraction or preparation method;
f) Surrogates – Surrogate compounds must be added to all samples, standards, and blanks for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available;
g) Field Equipment Blanks – Analysis shall be performed at a frequency of one per batch of samples collected;
h) Instrumentation - Calibration of instrumentation and performance of periodic instrument checks shall be made according to manufacturer and EPA recommendations, and appropriate SOPs;
i) Performance Evaluations - Participation in performance evaluation and method studies available from EPA, American Society for Testing and Materials (ASTM), or other Agency. Performance evaluation under such a program is to be conducted, at least, on a semiannual basis;
j) Test Substance Purity - Each new shipment or lot of solvent, reagent or adsorbent will be evaluated for purity in accordance with appropriate SOPs;
k) Standards - Standards will be prepared and verified in accordance with appropriate SOPs;
l) QC limits and Controls - Calculation of QC limits and preparation of control charts will be performed in accordance with appropriate SOPs;
m) Deviations - Out of control events, or outlier data will be noted and corrective action will be taken in accordance with appropriate SOPs.

Documentation of all Quality Control activities performed specifically in conjunction with this project will be furnished along with sample results. Copies of all raw data, lab notes, chromatograms, standard curves, etc. shall be furnished upon request.

5.3 Chemical Testing and Screening of Data

The applicant should check with their analytical provider to ensure that the methods and/or detection limits can be met. The analytical data from dredging must be evaluated for potential impacts to aquatic receptors

by screening surface water, elutriate and sediment. Once removed from an aquatic environment, sediment is considered to be soil and must be screened against risk-based soil screening benchmarks for possible future uses and exposures to both human and terrestrial ecological receptors. The applicant must ensure that the analytical method is able to achieve the sensitivity necessary to pass the most stringent of the criteria for each analyte. Additional information on screening analytical data can be found in the US ACE Galveston District's report writing guidance document for third party dredging.

In order to simplify and streamline the application process, COCs have been divided into two categories: (1) common COC and parameters and (2) special land use/history COCs and parameters. It is the expectation of the Galveston District that most third party dredging applicants will fall into the first category, however, justification must be provided to support this.

5.3.1 Chemical Testing and Screening – Common COCs and Parameters

Common COCs and parameters to be analyzed in each medium (surface water/elutriate, sediment, soil) along with target detection limits (TDLs) are listed in Tables 3 through 6. When more than one screening benchmark is presented in the table, the order of criteria selection (highest priority to lowest priority) should be:

a) Surface water and elutriate (Table 3): (1) TSWQS (marine – acute); (2) US EPA WQS (marine – acute); (3) NOAA (marine – acute); and (4) US EPA Region 6.
b) Sediment (Table 4): (1) NOAA (marine ER-L); and (2) US EPA R6 (marine).
c) Soil – Human (Table 5): TCEQ-TRRP.
d) Soil – Ecological (terrestrial) (Table 6): (1) TCEQ; and (2) US EPA EcoSSLs.

5.3.2 Chemical Testing and Screening - Special Land Use/History COCs and Parameters

In some instances, additional analyses will be required because of historical releases, surrounding land use history (industries such as shipyard fabrication and scrap metal operations), recent releases, land use changes, and/or flow conditions (example slackwater channel). Special land use/history COCs and parameters along with TDLs and/or screening criteria/benchmarks are listed in Tables 7 through 10. Screening criteria prioritization is the same as noted above in Section 5.3.1.

Failure to screen below criteria and benchmarks does not automatically mean that placement of dredged sediments will be denied; however, should exceedances of criteria occur, further evaluation, such as bioassays maybe required. Additional guidance on this is provided in the report writing guidance document.

6.0 DELIVERABLES

Deliverables shall include both hard copy and electronic versions of reports and data as outlined below.

A report compliant with the "Private Dredging Report Outline" provided by Galveston District shall be submitted at completion of the dredge material characterization. The report will include a description of the proposed project, sampling procedures, testing, evaluations of field observations and chemical analytical data and the conclusions reached. Submittal requirements include:

- One hard copy of the report and all accompanying figures and tables;
- One PDF electronic copy of the report and all accompanying figures and tables;
- PDF files of all laboratory reports for chemical and physical analyses/characterization;
- Laboratory Electronic Data Deliverables (EDDs) in Excel format ONLY.

Electronic versions of reports and data shall be submitted to Ms. Lisa Finn (Lisa.M.Finn@usace.army.mil) and Ms. Emily Drastata (Emily.A.Drastata@usace.army.mil). Hard copy versions shall be submitted to the attention of Ms. Lisa Finn at U.S. Army Corps of Engineers, Galveston District Operations Division, P.O. Box 1229, Galveston, Texas 77553-1229.

7.0 REFERENCES

Buchman, M.R. (2008) NOAA Screening Quick Reference Tables, NOA OR&R Report 08-1. Seattle WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34-pages. http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

Plumb, R.H., Jr. (1981) Procedure for Handling and Chemical Analysis of Sediment and Water Samples. EPA/CE-81-1. Prepared by State University College at Buffalo, Great Lakes Laboratory, Buffalo, N.Y. U.S. Environmental Protection Agency and U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS.

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U.S. EPA (2014) National Recommended Water Quality Criteria.
http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

U.S. EPA (2010) Ecological Soil Screening Levels (Eco-SSLs). http://www.epa.gov/ecotox/ecossl/

U.S. EPA (2013) SW-846 On-line. http://www.epa.gov/epawaste/hazard/testmethods/sw846/online/index.htm

U.S. EPA Region 6 (2013) Texas Water Quality Standards.
http://www.epa.gov/region6/water/ecopro/watershd/standard/index.htm

Figure 1A: (EXAMPLE) Dredging Footprint with Sampling Locations
Private Dredging Application 2015

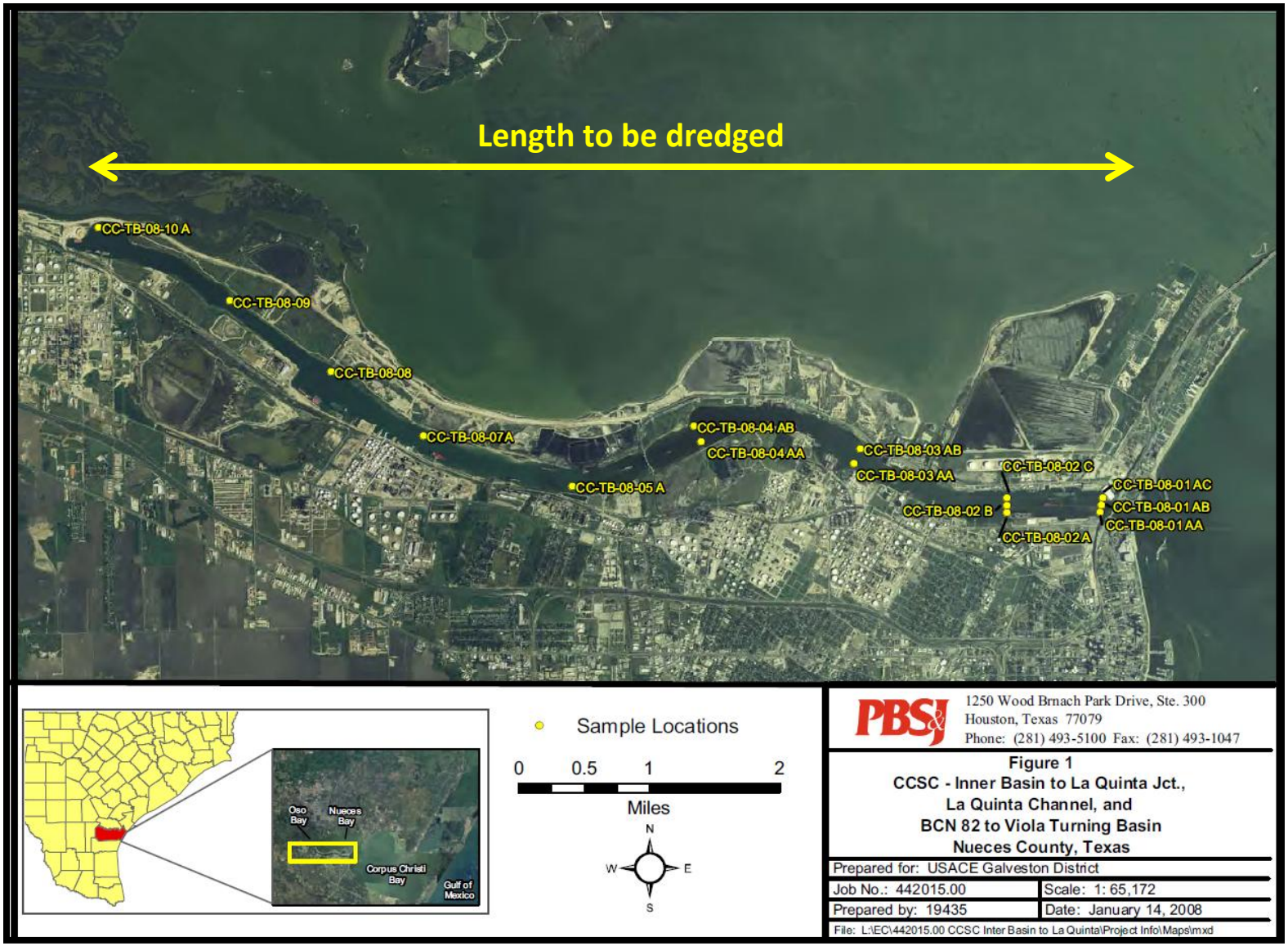
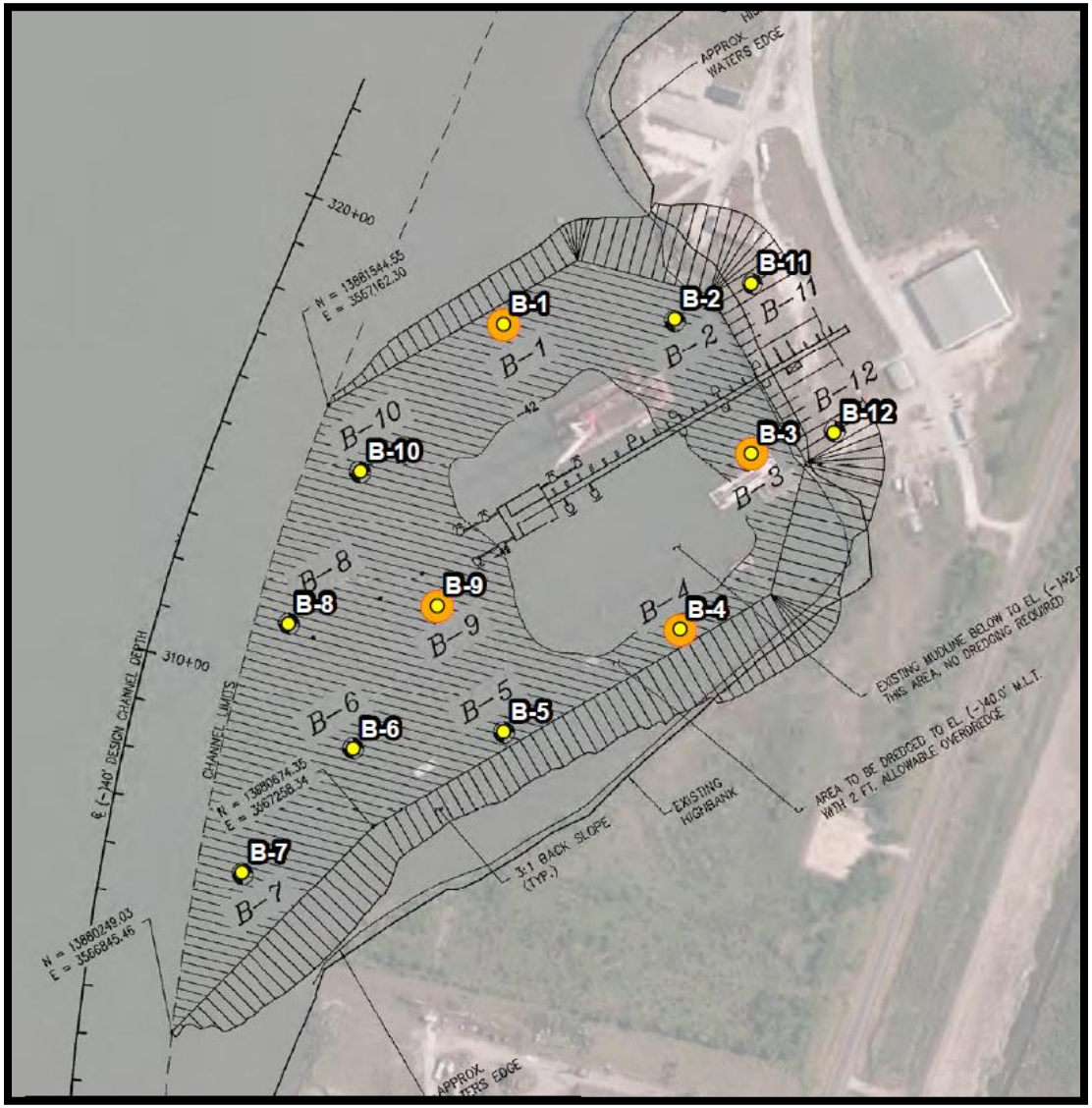


Figure 1B: (EXAMPLE) Dredging Footprint with Sampling Locations Private Dredging Application



Add Site-specific details as appropriate

Legend

- Proposed Sediment Sample Locations (SAP)
- Elutriate Media Collection and Water Sample

N

0 150 300 FEET

1 " = 300 '

1:3,600

Table 1: (EXAMPLE) Summary of Sample Collection Sites and Analyses
Private Marine Dredging Application

Sample Number	Location (State Plane NAD 83, Feet)	Sample Matrix	Analyses(1,2)
XXXX-01	**Station YY1**	**Composited Sediment Sample**	**W, S, E, GS**
XXXX-01A	YY1 Easting; ZZ1 Northing	Sediment	Component of XXXX-01
XXXX-01B	YY1 Easting; ZZ1 Northing	Sediment, Water	Component of XXXX-01
XXXX-01C	YY1 Easting; ZZ1 Northing	Sediment	Component of XXXX-01
XXXX-02	**Station YY2**	**Composited Sediment Sample**	**S, GS**
XXXX-02A	YY2 Easting; ZZ2 Northing	Sediment	Component of XXXX-02
XXXX-02B	YY2 Easting; ZZ2 Northing	Sediment	Component of XXXX-02
XXXX-02C	YY2 Easting; ZZ2 Northing	Sediment	Component of XXXX-02

Footnotes:

1) W = Analysis of a water sample, S = Analysis of a sediment sample, E = Analysis of an elutriate sample, GS = Grain-size analysis.

Table 2: Summary of Recommended (consult with your analytical provider) Procedures for Sample Collection, Preservation and Storage [(a)] Private Marine Dredging Application

Analyses	Collection Method[b]	Amount Required[c]	Container[d]	Preservation Technique	Storage Conditions	Holding Times[e]
SEDIMENT						
Chemical/Physical Analyses						
Metals	Grab	100 g	Pre-cleaned polyethylene jar[f]	Dry ice[f] or freezer storage for extended storages; otherwise refrigerate	$4^{o}C$	Hg - 28 days Others - 6 months[g]
Volatile Organic Compounds	Grab	100 g	Encore Sampler or Solvent-rinsed glass jar with Teflon lid[f]	Low level VOCs in Encores: NaHSO4 preservation within 24 hrs of collection; On-Site MeOH preservation for "high" samples. Dry ice[f] or freezer storage for extended storages; otherwise refrigerate	$4^{o}C$[f]/dark[g]	14 days for sample analysis if preserved[m]
Organic Compounds (e.g., PCBs, pesticides, polycyclic aromatic hydrocarbons	Grab	250 g	Solvent-rinsed glass jar with Teflon lid[f]	Dry ice[f] or freezer storage for extended storages; otherwise refrigerate	$4^{o}C$[f]/dark[g]	14 days[h]
Particle Size	Grab	100g	Whirl-pac bag[f]	Refrigerate	$<4^{o}C$	Undetermined
Total Organic Carbon (TOC)	Grab	50 g	Heat treated glass vial with Teflon-lined lid[f]	Dry ice[f] or freezer storage for extended storages; otherwise refrigerate	$4^{o}C$[f]	14 days
Total solids/specific gravity	Grab	50 g	Whirl-pac bag	Refrigerate	$<4^{o}C$	Undetermined
Miscellaneous	Grab	50g	Whirl-pac bag	Refrigerate	$<4^{o}C$	Undetermined

Table 2: Summary of Recommended (consult with your analytical provider) Procedures for Sample Collection, Preservation and Storage [(a)] Private Marine Dredging Application

Sediment from which elutriate is prepared	Grab	Depends on tests being performed	Glass with Teflon-lined lid	Completely fill and refrigerate	$4^{o}C$/dark/airtight	14 days
Biological Tests						
Dredged material	Grab	12-15 L per sample	Plastic bag or container[i]	Completely fill and refrigerate; sieve	$4^{o}C$/dark/airtight	14 days[j]
Reference sediment	Grab	45-50 L per test	Plastic bag or container[i]	Completely fill and refrigerate; sieve	$4^{o}C$/dark/airtight	14 days[j]
Control sediment	Grab	21-25 L per test	Plastic bag or container[i]	Completely fill and refrigerate; sieve	$4^{o}C$/dark/airtight	14 days[j]
WATER AND ELUTRIATE						
Chemical/Physical Analyses						
Particulate analysis	Discrete sampler or pump	500- 2000 mL	Plastic or glass	Lugols solution and refrigerate	$4^{o}C$	Undetermined
Metals	Discrete sampler or pump	1 L	Acid-rinsed polyethylene or glass jar[k]	pH <2 with HNO_3[k]; refrigerate	$4^{o}C$ $2^{o}C$[k]	Hg - 14 days Others - 6 months[l]
Total Kjeldahl nitrogen (TKN)	Discrete sampler or pump	100 - 200 mL	Plastic or glass[l]	H_2SO_4 to pH <2; refrigerate	$4^{o}C$[l]	24 h[l]
Chemical oxygen demand (COD)	Discrete sampler or pump	200 mL	Plastic or glass[l]	H_2SO_4 to pH <2; refrigerate	$4^{o}C$[l]	7 days[l]

Table 2: Summary of Recommended (consult with your analytical provider) Procedures for Sample Collection, Preservation and Storage [(a)]
Private Marine Dredging Application

Total organic carbon (TOC)	Discrete sampler or pump	100 mL	Plastic or glass[l]	H_2SO_4 to pH <2; refrigerate	4^oC[l]	<48 h[l]
Total inorganic carbon (TIC)	Discrete sampler or pump	100 mL	Plastic or glass[l]	Airtight seal; refrigerate[h]	4^oC[l]	6 months[l]
Phenolic compounds	Discrete sampler or pump	1 L	Glass[l]	0.1 - 1.0 g $CuSO_4$; H_2SO_4 to pH <2; refrigerate	4^oC[l]	24 h[l]
Soluble reactive phosphates	Discrete sampler or pump	-	Plastic or glass[l]	Filter; refrigerate[h]	4^oC[l]	24 h[l]
Extractable organic compounds (e.g., semivolatiles)	Discrete sampler or pump	4 L	Amber glass bottle[k]	pH <2, 6N HCL; airtight seal; refrigerate	4^oC[k]	7 days for extraction; 40 days for extract analysis[k]
Volatile organic compounds	Discrete sampler or pump	80 mL	Glass vial[k]	pH <2 with 1:1 HCL; refrigerate in airtight, completely filled container[k]	4^oC[k]	14 days for sample analysis if preserved[m]
Total phosphorus	Discrete sampler or pump	-	Plastic or glass[l]	H_2SO_4 to pH <2; refrigerate	4^oC[l]	7 days[l]
Total solids	Discrete sampler or pump	200 mL	Plastic or glass[l]	Refrigerate	4^oC[l]	7 days[l]
Sulfides	Discrete sampler or pump	-	Plastic or glass[l]	pH >9 NaOH (ZnAc); refrigerate	4^oC[l]	24 h[l]

Table 2: Summary of Recommended (consult with your analytical provider) Procedures for Sample Collection, Preservation and Storage [(a)]
Private Marine Dredging Application

Volatile solids	Discrete sampler or pump	200 mL	Plastic or glass[l]	Refrigerate	$4^{o}C$[l]	7 days[l]
Biological Tests						
Site water	Grab	Depends on tests being performed	Plastic carboy	Refrigerate	$< 4^{o}C$	14 days
Dilution water	Grab or makeup	Depends on tests being performed	Plastic carboy	Refrigerate	$< 4^{o}C$	14 days
TISSUE						
Chemical Analyses						
Metals	Trawl/Teflon-coated grab	5 - 10 g	Double Ziploc[f]	Handle with nonmetallic forceps; plastic gloves; dry ice[f]	$-20^{o}C$[f] or freezer storage	Hg - 28 days; Others - 6 months[n]
PCBs and chlorinated pesticides	Trawl/Teflon-coated grab	10 - 25 g	Hexane-rinsed double aluminum foil and double Ziploc[f]	Handle with hexane-rinsed stainless steel forceps; dry ice[f]	$-20^{o}C$[f] or freezer storage	14 days[h]
Volatile organic compounds	Trawl/Teflon-coated grab	10 - 25 g	Heat-cleaned aluminum foil and watertight plastic bag[m]	Covered ice chest[g]	$-20^{o}C$[h] or freezer storage	14 days[n]

Table 2: Summary of Recommended (consult with your analytical provider) Procedures for Sample Collection, Preservation and Storage [(a)] Private Marine Dredging Application

Semivolatile organic compounds (e.g., PAH)	Trawl/Teflon -coated grab	10 - 25 g	Hexane-rinsed double aluminum foil and double Ziploc[f]	Handle with hexane-rinsed stainless steel forceps; dry ice[f]	-20^{O}C[f] or freezer storage	14 days[h]
Lipids	Trawl/Teflon -coated grab	part of organic analyses	Hexane-rinsed aluminum foil	Handle with hexane-rinsed stainless steel forceps; quick freeze	-20^{O}C or freezer storage	14 days[h]

Footnotes

a This table contains only a summary of collection, preservation, and storage procedures for samples. Check for consistency with the sampling and analyses required for your program. This table may not contain all samples/analyses you need OR may list samples/analyses you do not need for your particular project. Additionally, CONSULT WITH YOUR ANALYTICAL PROVIDER. The cited references should be consulted for a more detailed description of these procedures (Inland Testing Manual, EPA-823-B-98-004).

b Collection method should include appropriate liners

c Amount of sample required by the laboratory to perform the analysis (wet weight or volume provided, as appropriate). CONFIRM THESE QUANTITIES WITH YOUR ANALYTICAL PROVIDER!! Miscellaneous sample size for sediment should be increased if auxiliary analytes that cannot be included as part of the organic or metal analyses are added to the list. The amounts shown are not intended as firm values; more or less tissue may be required depending on the analytes, matrices, detection limits, and particular analytical laboratory.

d All containers should be certified as clean according to EPA (1990)

e These holding times are for sediment, water, and tissue based on guidance that is sometimes administrative rather than technical in nature. There are no promulgated, scientifically based holding time criteria for sediments, tissues, or elutriates. References should be consulted if holding times for sample extracts are desired. Holding times are from the time of sample collection.

f NOAA (1989)

g Tetra Tech (1986a)

h Sample may be held for up to one year if at -20^{O}C.

i Polypropylene should be used if phthalate bioaccumulation is of concern.

j Two weeks is recommended; sediments must not be held for longer than 8 weeks prior to biological testing.

k EPA (1987); 40 CFR Part 136, Table III

l Plumb (1981)

m If samples are not preserved to pH<2, then aromatic compounds must be analyzed within 7 days.

n Tetra Tech (1986b)

Table 3: Target Detection Levels (TDLs), Screening Benchmarks and Analytical Methodology for Analysis of Common COCs and Parameters for Marine Water and Elutriate, Private Dredging Application

Chemical	CAS #	Units	TDL- Marine	Screening Benchmarks				Suggested Methods [f]
			Region 6 [a]	TSWQS (Marie Acute) [b]	EPA WQC (Marine Acute) [c]	NOAA (Marine Acute) [d]	Region 6 (Marine Acute) [e]	
Semivolatiles								
1,2,4-Trichlorobenzene	120-82-1	ug/L	0.9[h]	-	-	160	22	8270C, GC-MS SIM Mode; 1625C, 3510A, 3520A/8100, 8240A, 8250, 8260, 8270A, 8310
1,2-Dichlorobenzene	95-50-1	ug/L	0.8[h]	-	-	1,970	591	
1,3-Dichlorobenzene	541-73-1	ug/L	0.9[h]	-	-	1,970	142	
1,4-Dichlorobenzene	541-73-1	ug/L	1[h]	-	-	1,970	99	
2,4-Dichlorophenol	120-83-2	ug/L	0.8[h]	-	-	-	-	
2,4-Dimethylphenol	105-67-9	ug/L	10	-	-	-	-	
2,4-Dinitrophenol	51-28-5	ug/L	5[h]	-	-	4,850	1330	
Acenaphthene	83-32-9	ug/L	0.75[h]	-	-	970	40.4	
Acenaphthylene	208-96-8	ug/L	1.0[h]	-	-	300	-	
Anthracene	120-12-7	ug/L	0.6[h]	-	-	300	0. 18	
Benzo(a)anthracene	56-55-3	ug/L	0.4[h]	-	-	300	-	
Benzo(a)pyrene	50-32-8	ug/L	0.3[h]	-	-	300	-	
Benzo(b)fluoranthene	205-99-2	ug/L	0.6[h]	-	-	300	-	
Benzo(g,h,i)perylene	191-24-2	ug/L	1.2[h]	-	-	300	-	
Benzo(k)fluoranthene	207-08-9	ug/L	0.6[h]	-	-	300	-	
Chrysene	218-01-9	ug/L	0.3[h]	-	-	300	-	
Dibenzo(a,h)anthracene	53-70-3	ug/L	1.3[h]	-	-	300	-	
Diethyl Phthalate	84-66-2	ug/L	1[h]	-	-	2,944	884	
Fluoranthene	206-44-0	ug/L	0.9[h]	-	-	40	2.96	
Fluorene	86-73-7	ug/L	0.6[h]	-	-	300	50	
Hexachlorobenzene	118-74-1	ug/L	0.4[h]	-	-	160	-	
Indeno[1,2,3-c,d]pyrene	193-39-5	ug/L	1.2[h]	-		300	-	
Naphthalene	91-20-3	ug/L	0.8[h]	-	-	-	250	
Pentachlorophenol	87-86-5	ug/L	50	15.1	13	13	9.6	
Phenanthrene	85-01-8	ug/L	0.5[h]	7.7	-	7.7	4.6	
Phenol	108-95-2	ug/L	10	-	-	5,800	5,500	
Pyrene	129-00-0	ug/L	1.5[h]	-	-	300	0. 24	
Pesticides								
4,4'-DDD	72-54-8	ug/L	0.1	0.13	-	3.6	0. 025	608, 3510A, 3520A/8080, 8081A
4,4'-DDE	72-55-9	ug/L	0.1	-	-	14	0. 14	
4,4'-DDT	50-29-3	ug/L	0.1	-	0.13 (G, ii)	0.065	0. 001	
Aldrin	309-00-2	ug/L	0.03[h]	1.3	1.3 (G)	0.65	0. 13	

Table 3: Target Detection Levels (TDLs), Screening Benchmarks and Analytical Methodology for Analysis of Common COCs and Parameters for Marine Water and Elutriate, Private Dredging Application

Chemical	CAS #	Units	TDL- Marine	Screening Benchmarks				Suggested Methods [f]
			Region 6 [a]	TSWQS (Marie Acute) [b]	EPA WQC (Marine Acute) [c]	NOAA (Marine Acute) [d]	Region 6 (Marine Acute) [e]	
Alpha-BHC	319-84-6	ug/L	0.03	-	-	-	-	608, 3510A, 3520A/8080, 8081A
Beta-BHC	319-85-7	ug/L	0.03	-	-	-	-	
Chlordane and Derivatives	57-74-9	ug/L	0.03[h]	0.09	0.09 (G)	-	-	
Delta-BHC	319-86-8	ug/L	0.03	-	-	-	-	
Dieldrin	60-57-1	ug/L	0.03	0.71	0.71 (G)	0.355	0. 002	
Endosulfan and Derivatives	115-29-7	ug/L	0.1	0.034	0.034 (G, Y)	0.017	-	
Endrin and Derivatives	72-20-8	ug/L	0.1	0.037	0.037 (G)	0.0185	0. 002	
Gamma-BHC (lindane)	58-89-9	ug/L	0.1	-	0.16 (G)	0.08	-	
Heptachlor and Derivatives	76-44-8	ug/L	0.1	0.053	0.053 (G)	0.0265	0. 004	
Toxaphene	8001-35-2	ug/L	0.5	0.21	90 (D)	0.21	0. 0002	
Polychlorinated Biphenyls								
Total PCB	1336-36-3	ug/L	0.01	10	-	0.033	-	8082
Metals [g]								
Antimony	7440-36-0	ug/L	3 (0.03)[i]	-	-	1,500	500	200.8, 6010 or 6020
Arsenic	7440-38-2	ug/L	1 (0.011)[i]	149w	69 (A, D)	69	78	
Cadmium	7440-43-9	ug/L	1 (0.01)[i]	40w	40 (D)	40	-	
Chromium (total)	7440-47-3	ug/L	1	-	-	-	103	
Copper	7440-50-8	ug/L	1 (0.1)[i]	13.5w	4.8 (D, cc)	4.8	3.6	
Lead	7439-92-1	ug/L	1 (0.03)[i]	133w	210 (D)	210	5.3	
Mercury	7439-97-6	ug/L	0.2 (0.0003)[i]	2.1	-	1.8	1.1	7471, 7420, 245.1
Nickel	7440-02-0	ug/L	1 (0.1)[i]	118w	74 (D)	74	13.1	200.8, 6010 or 6020
Silver	7440-22-4	ug/L	1 (0.1)[i]	2w	1.9 (D)	0.95	-	
Zinc	7440-66-6	ug/L	1 (0.5)[i]	92.7w	90 (D)	90	84.2	
Miscellaneous Parameters								
Ammonia	NH3	mg/l	0.03	-	-	-	-	350.1, 350.2, 350.3
Total Organic Carbon	Q129	%	0.10%	-	-	-	-	9060, 415.1, APHA 5310D
Total Petroleum Hydrocarbons	8012-95-1	mg/l	0.1	-	-	-	NA	418.1, 8021, TNRCC 1005 & 1006

Selected Criteria

FOOTNOTES:

Table 3: Target Detection Levels (TDLs), Screening Benchmarks and Analytical Methodology for Analysis of Common COCs and Parameters for Marine Water and Elutriate, Private Dredging Application

Chemical	CAS #	Units	TDL- Marine	Screening Benchmarks				Suggested Methods [f]
			Region 6 [a]	TSWQS (Marie Acute) [b]	EPA WQC (Marine Acute) [c]	NOAA (Marine Acute) [d]	Region 6 (Marine Acute) [e]	

a) This list may include analyses and analytes not required for your site, or may not include site-specific requirements for your site. Consult with the Galveston District. The primary source of these TDLs was EPA 823-B-95-001, QA/QC Guidance for Sampling and Analysis of Sediments, Water and Tissues for Dredged Material Evaluations. (http://water.epa.gov/polwaste/sediments/cs/upload/evaluationguide.pdf)

b) TSWQS- https://www.tceq.texas.gov/waterquality/standards/2010standards.html

c) EPA WQC- http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

d) NOAA- http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html

e) Region 6- http://www.epa.gov/region6/water/ecopro/watershd/standard/index.htm

f) Suggested methods from USEPA, 1995, "QA/QC Guidance for Sediment and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations" (http://water.epa.gov/polwaste/sediments/cs/upload/evaluationguide.pdf), the SERIM (http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100FTIH.TXT), and the USEPA Region 6 RIA (http://www.epa.gov/region6/water/ecopro/em/ocean/text/ria.pdf). Any method that can achieve these TDLs is acceptable, provided the appropriate documentation of the method performance is generated for the project and the method is adequately identified and described in the SAP.

g) Metals shall be expressed as Dissolved values in water samples, except for mercury, which shall be reported as Total Recoverable Concentrations

h) These values are based on recommendations from the EPA Region 6 laboratory in Houston; these values were based on data or other technical basis.

i) The values in parentheses are based on EPA "clean techniques", (EPA 1600 series methods) which are applicable in instances where other TDLs are inadequate to assess EPA water quality criteria.

TSWQS footnotes (footnote letters from TCEQ, only footnotes for constituents of concern are retained in this table):

w) Indicates that a criterion is multiplied by a water-effect ratio (WER) in order to incorporate the effects of local water chemistry on toxicity. The WER is equal to 1 except where sufficient data is available to establish a site-specific WER.

EPA WQC footnotes (footnote letters from NRWRC, only footnotes for constituents of concern are retained in this table)

A) This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive. Please consult the criteria document for details.

D) Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic life Metals Criteria (PDF)," (49 pp, 3MB) October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available on NSCEP's web site and 40CFR§131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble- Conversion Factors for Dissolved Metals.

G) This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (PDF) (153 pp, 7.3MB) (EPA 440/5-80-019), Chlordane (PDF) (68 pp, 3.1MB) (EPA 440/5-80-027), DDT (PDF) (175 pp, 8.3MB) (EPA 440/5-80-038), Endosulfan (PDF) (155 pp, 7.3MB) (EPA 440/5-80-046), Endrin (PDF) (103 pp, 4.6MB) (EPA 440/5-80-047), Heptachlor (PDF) (114 pp, 5.4MB) (EPA 440/5-80-052), Hexachlorocyclohexane (PDF) (109 pp, 4.8MB) (EPA 440/5-80-054), Silver (EPA 440/5-80-071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines (PDF) (104 pp, 3.3MB). If evaluation is to be done using an averaging period, the acute criteria values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

Y) This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.

cc) When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effect Ratios might be appropriate.

ii)This criterion applies to DDT and its metabolites (i.e., the total conc. DDT plus metabolites should not exceed this value).

Table 4: Target Detection Levels (TDLs), Screening Benchmarks and Analytical Methodology for Bulk Analysis of Common COCs and Parameters for Marine Sediment (dry weight), Private Dredging Application

Chemical	CAS #	Units	TDL- Marine	Screening Benchmarks			Suggested Methods [d]
			Region 6 [a]	NOAA (Marine) [b]		Region 6 (Marine) [c]	
				ERL	ERM		
Semivolatiles							
1,2,4-Trichlorobenzene	120-82-1	ug/kg	10	-	-	-	8270C; GC-MS in SIM mode; 1625C, 3540A, 3550A/8100, 8240A, 8250, 8260, 8270A
1,2-Dichlorobenzene	95-50-1	ug/kg	20	-	-	-	
1,3-Dichlorobenzene	541-73-1	ug/kg	20	-	-	-	
1,4-Dichlorobenzene	541-73-1	ug/kg	20	-	-	-	
2,4-Dichlorophenol	120-83-2	ug/kg	120[f]	-	-	-	
2,4-Dimethylphenol	105-67-9	ug/kg	20	-	-	-	
2,4-Dinitrophenol	51-28-5	ug/kg	500[f]	-	-	-	
Acenaphthene	83-32-9	ug/kg	20	16	500	16	
Acenaphthylene	208-96-8	ug/kg	20	44	640	44	
Anthracene	120-12-7	ug/kg	20	85.3	1,100	85.3	
Benzo(a)anthracene	56-55-3	ug/kg	20	261	1,600	261	
Benzo(a)pyrene	50-32-8	ug/kg	20	430	1,600	430	
Benzo(b)fluoranthene	205-99-2	ug/kg	20	-	-	-	
Benzo(g,h,i)perylene	191-24-2	ug/kg	20	-	-	-	
Benzo(k)fluoranthene	207-08-9	ug/kg	20	-	-	-	
Chrysene	218-01-9	ug/kg	20	384	2,800	384	
Dibenzo(a,h)anthracene	53-70-3	ug/kg	20	63.4	260	63.4	
Diethyl Phthalate	84-66-2	ug/kg	50	-	-	-	
Fluoranthene	206-44-0	ug/kg	20	600	5,100	600	
Fluorene	86-73-7	ug/kg	20	19	540	19	
Hexachlorobenzene	118-74-1	ug/kg	10	-	-	-	
Indeno[1,2,3-c,d]pyrene	193-39-5	ug/kg	20	-	-	-	
Naphthalene	91-20-3	ug/kg	20	160	2,100	160	
Pentachlorophenol	87-86-5	ug/kg	100	-	-	-	
Phenanthrene	85-01-8	ug/kg	20	240	1,500	240	
Phenol	108-95-2	ug/kg	100	-	-	-	
Pyrene	129-00-0	ug/kg	20	665	2,600	665	
Pesticides							
4,4'-DDD	72-54-8	ug/kg	5[f]	2	20	1.22	3540A, 3550A/8080, 8081A
4,4'-DDE	72-55-9	ug/kg	5[f]	2.2	27	2.07	
4,4'-DDT	50-29-3	ug/kg	5[f]	1	7	1.19	
Aldrin	309-00-2	ug/kg	3[f]	-	-	-	
Alpha-BHC	319-84-6	ug/kg	3[f]	-	-	-	
Beta-BHC	319-85-7	ug/kg	3[f]	-	-	-	
Chlordane and Derivatives	57-74-9	ug/kg	3[f]	-	-	-	
Delta-BHC	319-86-8	ug/kg	3[f]	-	-	-	
Dieldrin	60-57-1	ug/kg	5[f]	0.02	8	0.715	
Endosulfan and Derivatives	115-29-7	ug/kg	5[f]	-	-	-	
Endrin and Derivatives	72-20-8	ug/kg	5[f]	-	-	-	
Gamma-BHC (Lindane)	58-89-9	ug/kg	3[f]	-	-	-	
Heptachlor and Derivatives	76-44-8	ug/kg	3[f]	-	-	-	
Toxaphene	8001-35-2	ug/kg	50	-	-	-	
Polychlorinated Biphenyls							
Total PCB	1336-36-3	ug/kg	1	22.7 (g)	180	22.7 (g)	8082
Metals [e]							
Antimony	7440-36-0	mg/kg	2.5	-	-	-	6010/6020 , 3050A/7421, 7420, 3010A
Arsenic	7440-38-2	mg/kg	1	8.2	70	8.2	
Cadmium	7440-43-9	mg/kg	1	1.2	9.6	1.2	
Chromium (total)	7440-47-3	mg/kg	1	81	370	81	
Copper	7440-50-8	mg/kg	10	34	270	34	

Table 4: Target Detection Levels (TDLs), Screening Benchmarks and Analytical Methodology for Bulk Analysis of Common COCs and Parameters for Marine Sediment (dry weight), Private Dredging Application

Chemical	CAS #	Units	TDL- Marine	Screening Benchmarks			Suggested Methods [d]
			Region 6 [a]	NOAA (Marine) [b]		Region 6 (Marine) [c]	
				ERL	ERM		
Lead	7439-92-1	mg/kg	10	46.7	218	46.7	6010/6020 , 3050A/7421, 7420, 3010A
Mercury	7439-97-6	mg/kg	0.1	0.15	0.71	0.15	7471
Nickel	7440-02-0	mg/kg	10	20.9	51.6	20.9	6010/6020, 3050A/7421, 7420, 3010A
Silver	7440-22-4	mg/kg	1	1	3.7	1	
Zinc	7440-66-6	mg/kg	10	150	410	150	
Miscellaneous Parameters							
Ammonia	NH3	mg/kg	0.1	-	-	-	350.1, 350.1
Grain Size (sand, silt, clay)	-	%	1%	-	-	-	Sieve & Hydrometer
Total Organic Carbon	Q129	%	0.10%	-	-	-	9060
Total Petroleum Hydrocarbons	8012-95-1	mg/kg	5	-	-	-	8021, 9070, 418.1, TRNCC 1005 & 1006
Total Solids/Dry Weight	-	%	0.10%	-	-	-	160.3

Selected Criteria

FOOTNOTES:

a) This list may include analyses and analytes not required for your site, or may not include site-specific requirements for your site. Consult with the Galveston District. The primary source of these TDLs was EPA 823-B-95-001, QA/QC Guidance for Sampling and Analysis of Sediments, Water and Tissues for Dredged Material Evaluations. (http://water.epa.gov/polwaste/sediments/cs/upload/evaluationguide.pdf)

b) NOAA- http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html

c) Region 6- http://rais.ornl.gov/tools/eco_search.php

d) Suggested methods reported in USEPA, 1995, "QA/QC Guidance for Sediment and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations" (http://water.epa.gov/polwaste/sediments/cs/upload/evaluationguide.pdf). Any method that can achieve these TDLs is acceptable, provided the appropriate documentation of the method performance is generated for the project and the method is adequately identified and described in the SAP.

e) Metals shall be expressed as Dissolved values in water samples, except for mercury and selenium, which shall be reported as Total Recoverable

f) These values are based on recommendations from the EPA Region 6 Laboratory in Houston; these values were based on data or other technical basis.

g) Total PCBs for Region 6 from "Update to Guidance for Conducting Ecological Risk Assessments at Remediation Sites in Texas" RG-263 (revised) January 2006; Total PCBs for NOAA from Squirt Table for Organics in Sediment

Table 5: Tier I Soil PCLs for Human Health Screening [Total Combined, Redidential and Commercial/Industrial] for Common COCs and Parameters, Private Dredging Application

Chemical	CAS #	Units	Screening Benchmarks[a]	
			Residential[b]	Commercial/Industrial[c]
Semivolatiles				
1,2,4-Trichlorobenzene	120-82-1	mg/kg	7.0E+01	1.1E+02
1,2-Dichlorobenzene	95-50-1	mg/kg	3.9E+02	5.7E+02
1,3-Dichlorobenzene	541-73-1	mg/kg	6.2E+01	8.8E+01
1,4-Dichlorobenzene	541-73-1	mg/kg	2.5E+02	1.2E+03
2,4-Dichlorophenol	120-83-2	mg/kg	2.0E+02	2.0E+03
2,4-Dimethylphenol	105-67-9	mg/kg	1.3E+03	1.4E+04
2,4-Dinitrophenol	51-28-5	mg/kg	1.3E+02	1.4E+03
Acenaphthene	83-32-9	mg/kg	3.0E+03	3.7E+04
Acenaphthylene	208-96-8	mg/kg	3.8E+03	3.7E+04
Anthracene	120-12-7	mg/kg	1.8E+04	1.9E+05
Benzo(a)anthracene	56-55-3	mg/kg	4.1E+01	1.7E+02
Benzo(a)pyrene	50-32-8	mg/kg	4.1E+00	1.7E+01
Benzo(b)flouranthene	205-99-2	mg/kg	4.1E+01	1.7E+02
Benzo(g,h,i)perylene	191-24-2	mg/kg	1.8E+03	1.9E+04
Benzo(k)fluoranthene	207-08-9	mg/kg	4.2E+02	1.7E+03
Chrysene	218-01-9	mg/kg	4.1E+03	1.7E+04
Dibenzo(a,,h)anthracene	53-70-3	mg/kg	4.0E+00	1.7E+01
Diethyl Phthalate	84-66-2	mg/kg	5.3E+04	5.5E+05
Fluoranthene	206-44-0	mg/kg	2.3E+03	2.5E+04
Fluorene	86-73-7	mg/kg	2.3E+03	2.5E+04
Hexachlorobenzene	118-74-1	mg/kg	1.0E+00	6.9E+00
Indeno[1,2,3-c,d]pyrene	193-39-5	mg/kg	4.2E+01	1.7E+02
Naphthalene	91-20-3	mg/kg	1.2E+02	1.9E+02
Pentachlorophenol	87-86-5	mg/kg	7.3E-01	3.2E+01
Phenanthrene	85-01-8	mg/kg	1.7E+03	1.9E+04
Phenol	108-95-2	mg/kg	9.5E+02	1.4E+03
Pyrene	129-00-0	mg/kg	1.7E+03	1.9E+04
Pesticides				
4,4'-DDD	72-54-8	mg/kg	1.4E+01	1.0E+02
4,4'-DDE	72-55-9	mg/kg	1.0E+01	7.3E+01
4,4'-DDT	50-29-3	mg/kg	5.4E+00	6.8E+01
Aldrin	309-00-2	mg/kg	5.0E-02	9.7E-01
Alpha-BHC	319-84-6	mg/kg	2.5E-01	2.9E+00
Alpha chlordane	5103-71-9	mg/kg	1.3E+01	5.4E+01
Beta-BHC	319-85-7	mg/kg	9.2E-01	1.1E+01
Beta (gamma) chlordane	5103-74-2	mg/kg	7.3E+00	5.1E+01
Delta-BHC	319-86-8	mg/kg	2.9E+00	1.2E+01
Dieldrin	60-57-1	mg/kg	1.5E-01	1.1E+00
Endosulfan	115-29-7	mg/kg	4.0E+02	4.1E+03
Endosulfan I	959-98-8	mg/kg	9.1E+01	1.4E+03

Table 5: Tier I Soil PCLs for Human Health Screening [Total Combined, Redidential and Commercial/Industrial] for Common COCs and Parameters, Private Dredging Application

Chemical	CAS #	Units	Screening Benchmarks[a]	
			Residential[b]	Commercial/Industrial[c]
Endosulfan II	33213-65-9	mg/kg	2.7E+02	4.1E+03
Endosulfan sulfate	1031-07-8	mg/kg	3.8E+02	4.1E+03
Endrin	72-20-8	mg/kg	9.0E+00	2.0E+02
Endrin aldehyde	7421-93-4	mg/kg	1.9E+01	2.0E+02
Endrin ketone	53494-70-5	mg/kg	1.9E+01	2.0E+02
Gamma-BHC (Lindane)	58-89-9	mg/kg	1.1E+00	1.8E+01
Gamma chlordane	5566-34-7	mg/kg	7.3E+00	5.1E+01
Heptachlor	76-44-8	mg/kg	1.3E-01	2.8E+00
Heptachlor epoxide	1024-57-3	mg/kg	2.4E-01	1.9E+00
Toxaphene	8001-35-2	mg/kg	1.2E+00	1.7E+01
Polychlorinated Biphenyls				
Total PCB	1336-36-3	mg/kg	1.1E+00	7.1E+00
Metals				
Antimony	7440-36-0	mg/kg	1.5E+01	3.1E+02
Arsenic	7440-38-2	mg/kg	2.4E+01	2.0E+02
Cadmium	7440-43-9	mg/kg	5.1E+01	7.7E+02
Chromium (total)	7440-47-3	mg/kg	2.7E+04	7.5E+04
Copper	7440-50-8	mg/kg	1.3E+03	9.4E+04
Lead	7439-92-1	mg/kg	-	-
Mercury (pH = 4.9)	7439-97-6	mg/kg	2.1E+00	3.3E+00
Mercury (pH = 6.8)	7439-97-6	mg/kg	5.5E+00	1.1E+01
Nickel	7440-02-0	mg/kg	8.4E+02	8.6E+03
Silver	7440-22-4	mg/kg	9.7E+01	2.3E+03
Zinc	7440-66-6	mg/kg	9.9E+03	2.5E+05
Metals				
Ammonia	NH3	mg/kg	2.5E+03	3.5E+03
Grain Size (sand, silt, clay)	-	%	-	-
Total Organic Carbon	Q129	%	-	-
Total Petroleum Hydrocarbons[d]	8012-95-1	mg/kg	1.1E+03	2.1E+03
Total Solids/Dry Weight	-	%	-	-

FOOTNOTES:

a) TCEQ Texas Risk Reduction Program (TRRP-http://tceq.texas.gov/remediation/trrp/guidance.html);lowest values are reported from 0.5 acre and 30 acre carinogenic and noncarcinogenic values.

b) Residential total soil combined include inhalation, ingestion, dermal, and vegetable consumption pathways.

c) Region 6- http://rais.ornl.gov/tools/eco_search.php

d) Suggested methods reported in USEPA, 1995, "QA/QC Guidance for Sediment and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations" (http://water.epa/gov/polwaste/sediments/cs/upload/evaluationguide.pdf). Any method that can achieve these TDLs is acceptable, provided the appropriate documentation of the method performance is generated for the project and the method is adequately

Table 6: Ecological Benchmarks for Soil for Common COCs and Parameters, Private Dredging Application

Chemical	CAS #	Units	Median Background	Screening Benchmarks			
				TCEQ [a]		EcoSSL [b]	
				Earthworms	Plants	Avian	Mammal
Semivolatiles							
1,2,4-Trichlorobenzene	120-82-1	ug/kg	-	2.0E+04	-	-	-
1,2-Dichlorobenzene	95-50-1	ug/kg	-	-	-	-	-
1,3-Dichlorobenzene	541-73-1	ug/kg	-	-	-	-	-
1,4-Dichlorobenzene	541-73-1	ug/kg	-	2.0E+04	-	-	-
2,4-Dichlorophenol	120-83-2	ug/kg	-	-	-	-	-
2,4-Dimethylphenol	105-67-9	ug/kg	-	-	-	-	-
2,4-Dinitrophenol	51-28-5	ug/kg	-	-	2.0E+04	-	-
Acenaphthene	83-32-9	ug/kg	-	-	2.0E+04	-	-
Acenaphthylene	208-96-8	ug/kg	-	-	-	-	-
Anthracene	120-12-7	ug/kg	-	-	-	-	-
Benzo(a)anthracene	56-55-3	ug/kg	-	-	-	-	-
Benzo(a)pyrene	50-32-8	ug/kg	-	-	-	-	-
Benzo(b)fluoranthene	205-99-2	ug/kg	-	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	ug/kg	-	-	-	-	-
Benzo(k)fluoranthene	207-08-9	ug/kg	-	-	-	-	-
Chrysene	218-01-9	ug/kg	-	-	-	-	-
Dibenzo(a,h)anthracene	53-70-3	ug/kg	-	-	-	-	-
Diethyl Phthalate	84-66-2	ug/kg	-	-	1.0E+05	-	-
Fluoranthene	206-44-0	ug/kg	-	-	-	-	-
Fluorene	86-73-7	ug/kg	-	3.0E+04	-	-	-
Hexachlorobenzene	118-74-1	ug/kg	-	-	-	-	-
Indeno[1,2,3-c,d]pyrene	193-39-5	ug/kg	-	-	-	-	-
Naphthalene	91-20-3	ug/kg	-	-	-	-	-
Pentachlorophenol	87-86-5	ug/kg	-	3.1E+04	5.0E+02	2.1E+03	2.8E+03
Phenanthrene	85-01-8	ug/kg	-	-	-	-	-
Phenol	108-95-2	ug/kg	-	3.0E+04	7.0E+04	-	-
Pyrene	129-00-0	ug/kg	-	-	-	-	-
Pesticides							
4,4'-DDD	72-54-8	ug/kg	-	-	-	9.3E+01	2.1E+01
4,4'-DDE	72-55-9	ug/kg	-	-	-	9.3E+01	2.1E+01
4,4'-DDT	50-29-3	ug/kg	-	-	-	9.3E+01	2.1E+01
Aldrin	309-00-2	ug/kg	-	-	-	-	-
Alpha-BHC	319-84-6	ug/kg	-	-	-	-	-
Alpha chlordane	5103-71-9	ug/kg	-	-	-	-	-
Beta-BHC	319-85-7	ug/kg	-	-	-	-	-
Beta chlordane	5103-74-2	ug/kg	-	-	-	-	-
Delta-BHC	319-86-8	ug/kg	-	-	-	-	-
Dieldrin	60-57-1	ug/kg	-	-	-	2.2E+01	4.9E+00
Endosulfan	115-29-7	ug/kg	-	-	-	-	-
Endosulfan I	959-98-8	ug/kg	-	-	-	-	-
Endosulfan II	33213-65-9	ug/kg	-	-	-	-	-
Endosulfan sulfate	1031-07-8	ug/kg	-	-	-	-	-
Endrin	72-20-8	ug/kg	-	-	-	-	-
Endrin aldehyde	7421-93-4	ug/kg	-	-	-	-	-
Endrin ketone	53494-70-5	ug/kg	-	-	-	-	-
Gamma-BHC (Lindane)	58-89-9	ug/kg	-	-	-	-	-
Gamma chlordane	5566-34-7	ug/kg	-	-	-	-	-
Heptachlor	76-44-8	ug/kg	-	-	-	-	-

Table 6: Ecological Benchmarks for Soil for Common COCs and Parameters, Private Dredging Application

Chemical	CAS #	Units	Median Background	Screening Benchmarks			
				TCEQ [a]		EcoSSL [b]	
				Earthworms	Plants	Avian	Mammal
Heptachlor epoxide	1024-57-3	ug/kg	-	-	-	-	-
Toxaphene	8001-35-2	ug/kg	-	-	-	-	-
Polychlorinated Biphenyls							
Total PCB	1336-36-3	ug/kg	-	-	4.0E+04	-	-
Metals							
Antimony	7440-36-0	mg/kg	1.0E+00	7.8E+01	5.0E+00	-	2.7E-01
Arsenic	7440-38-2	mg/kg	5.9E+00	6.0E+01	1.8E+01	4.3E+01	4.6E+01
Cadmium	7440-43-9	mg/kg	-	1.4E+02	3.2E+01	7.7E-01	3.6E-01
Chromium (total)	7440-47-3	mg/kg	3.0E+01	4.0E-01	1.0E+00	-	-
Copper	7440-50-8	mg/kg	1.5E+01	8.0E+01	7.0E+01	2.8E+01	4.9E+01
Lead	7439-92-1	mg/kg	1.5E+01	1.7E+03	1.2E+02	1.1E+01	5.6E+01
Mercury	7439-97-6	mg/kg	4.0E-02	1.0E-01	3.0E-01	-	-
Nickel	7440-02-0	mg/kg	1.0E+01	2.8E+02	3.8E+01	2.1E+02	1.3E+02
Silver	7440-22-4	mg/kg	-	-	5.6E+02	4.2E+00	1.4E+01
Zinc	7440-66-6	mg/kg	3.0E+01	1.2E+02	1.6E+02	4.6E+01	7.9E+01
Miscellaneous Parameters							
Ammonia	NH3	mg/kg	-	-	-	-	-
Grain Size (sand, silt, clay)	-	%	-	-	-	-	-
Total Organic Carbon	Q129	%	-	-	-	-	-
Total Petroleum Hydrocarbons	8012-95-1	mg/kg	-	-	-	-	-
Total Solids/Dry Weight	-	%	-	-	-	-	-

Footnotes:

a) TCEQ: Conducting Ecological Risk Assessments at Remediation Sites in Texas (2014) (http://www.tceq.texas.gov/remediation/eco/eco.html)

b) USEPA Eco-SSL: http://www.epa.gov/ecotox/ecossl/

Table 7: Target Detection Levels (TDLs), Screening Benchmarks and Analytical Methodology for Analysis of Special Land Use/History COCs and Parameters for Marine Water and Elutriate, Private Dredging Application

Chemical	CAS #	Units	TDL- Marine	Screening Benchmarks				Suggested Methods [f]
			Region 6 [a]	TSWQS (Marie Acute) [b]	EPA WQC (Marine Acute) [c]	NOAA (Marine Acute) [d]	Region 6 (Marine Acute) [e]	
Metals								
Chromium (3+)	7440-47-3 (III)	ug/L	1	-	-	103,000	-	6020
Chromium (6+)	7440-47-3 (Cr6+)	ug/L	1	1,090w	1,100 (D)	1,100	49.6	7196A, 7197, 218.5
Selenium [g]	7782-49-2	ug/L	2	564	290 (D, dd)	290	0.136	7740, 7741, 7742, 270.2, 270.2
Organotin								
Tributyltin	688-73-3	ug/L	0.01 [h]	-	-	-	-	Krone et al., 1989 (GC/FPD)
Miscellaneous Parameters								
Cyanides	57-12-5	mg/l	0.1 [i]	0.0056	1 (Q)	0.001	0.0056	335.2, 9010B/9012A

Footnotes:

a) This list may include analyses and analytes not required for your site, or may not include site-specific requirements for your site. Consult with the Galveston District. The primary source of these TDLs was EPA 823-B-95-001, QA/QC Guidance for Sampling and Analysis of Sediments, Water and Tissues for Dredged Material Evaluations. (http://water.epa.gov/polwaste/sediments/cs/upload/evaluationguide.pdf)

b) TSWQS- https://www.tceq.texas.gov/waterquality/standards/2010standards.html

c) EPA WQC- http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm

d) NOAA- http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html

e) Region 6- http://www.epa.gov/region6/water/ecopro/watershd/standard/index.htm

f) Suggested methods from USEPA, 1995, "QA/QC Guidance for Sediment and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations" (http://water.epa.gov/polwaste/sediments/cs/upload/evaluationguide.pdf), the SERIM (http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100FTIH.TXT), and the USEPA Region 6 RIA (http://www.epa.gov/region6/water/ecopro/em/ocean/text/ria.pdf). Any method that can achieve these TDLs is acceptable, provided the appropriate documentation of the method performance is generated for the project and the method is adequately identified and described in the SAP.

g) Selenium shall be reported as Total Recoverable Concentrations

h) TDL value taken from Southeast Regional Implementation Manual (2008) (http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100FTIH.TXT)

i) This value recommended by Houston lab using colorimetric method. This value is based upon FREE cyanide, not complexed as the method is designed to analyze for. If free cyanide is expected, consult the laboratory as to the best method for quantifying free cyanide.

EPA WQC footnotes (footnote letters from NRWRC, only footnotes for constituents of concern are retained in this table)

D) Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic life Metals Criteria (PDF)," (49 pp, 3MB) October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available on NSCEP's web site and 40CFR§131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble-Conversion Factors for Dissolved Metals.

dd) Selenium criteria document (EPA 440/5-87-006, September 1987)states that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the conc.of selenium exceeds 5.0 µg/l in salt water because the saltwater CCC does not take into account uptake via the food chain.

Q) This recommended water quality criterion is expressed as ug free cyanide (as CN)/l.

Table 8: Target Detection Levels (TDLs), Screening Benchmarks and Analytical Methodology for Analysis of Special Land Use/History COCs and Parameters for Marine Sediment (dry weight), Private Dredging Application

Chemical	CAS #	Units	TDL-Marine	Screening Benchmarks			Suggested Methods [d]
			Region 6 [a]	NOAA (Marine) [b]		Region 6 (Marine) [c]	
				ERL	ERM		
Polychlorinated Biphenyls [e]							
Polychlorinated Biphenyls-209 congeners	-	ug/kg	1	-	-	-	1668
Metals							
Chromium (3+)	7440-47-3 (III)	mg/kg	1	-	-	-	6010/6020
Chromium (6+)	7440-47-3	mg/kg	1	-	-	-	7196
Selenium [f]	7782-49-2	mg/kg	0.5	-	-	-	7741, 7740, 6010/6020
Organotin [g]							
Dibutyltin	1002-53-5	ug/kg	10	-	-	-	Krone et al., 1989 (GC/FPD)
Monobutyltin	78763-54-9	ug/kg	10	-	-	-	
Tributyltin	688-73-3	ug/kg	10	-	-	-	
Miscellaneous Parameters							
Cyanides	57-12-5	mg/kg	2	-	-	-	9010B/9012A
Volatile Organics							
Trichloroethene	79-01-6	ug/kg	5	-	-	-	P&T
Tetrachloroethene	127-18-4	ug/kg	0.1	-	-	-	
Ethylbenzene	100-41-4	ug/kg	1.5	-	-	-	
Total Xylene (sum of o-, m-, p-)	95-47-6 108-38-3 106-42-3	ug/kg	5	-	-	-	
Dioxins/Furans [h]							
2,3,7,8 - TCDD	1746-01-6	pg/g	0.1	-	-	-	1613B
1,2,3,7,8 - PeCDD	40321-76-4	pg/g	0.1	-	-	-	
1,2,3,4,7,8 - HxCDD	39227-28-6	pg/g	0.1	-	-	-	
1,2,3,6,7,8 - HxCDD	57653-85-7	pg/g	0.1	-	-	-	
1,2,3,7,8,9 - HxCDD	19408-74-3	pg/g	0.1	-	-	-	
1,2,3,4,6,7,8 - HpCDD	35822-46-9	pg/g	0.1	-	-	-	
OCDD	3268-87-9	pg/g	0.1	-	-	-	
2,3,7,8 - TCDF	51207-31-9	pg/g	0.1	-	-	-	
1,2,3,7,8 - PeCDF	57117-41-6	pg/g	0.1	-	-	-	
2,3,4,7,8 - PeCDF	57117-31-4	pg/g	0.1	-	-	-	
1,2,3,4,7,8 - HxCDF	70648-26-9	pg/g	0.1	-	-	-	
1,2,3,6,7,8 - HxCDF	57117-44-9	pg/g	0.1	-	-	-	
2,3,4,6,7,8 - HxCDF	60851-34-5	pg/g	0.1	-	-	-	
1,2,3,7,8,9 - HxCDF	72918-21-9	pg/g	0.1	-	-	-	
1,2,3,4,6,7,8 - HpCDF	67562-39-4	pg/g	0.1	-	-	-	
1,2,3,4,7,8,9 - HpCDF	55673-89-7	pg/g	0.1	-	-	-	
OCDF	39001-02-0	pg/g	0.1	-	-	-	
Total Dioxin TEQ	-	pg/g	20	-	-	-	-

FOOTNOTES:

a) This list may include analyses and analytes not required for your site, or may not include site-specific requirements for your site. Consult with the Galveston District. The primary source of these TDLs was EPA 823-B-95-001, QA/QC Guidance for Sampling and Analysis of Sediments, Water and Tissues for Dredged Material Evaluations. (http://water.epa.gov/polwaste/sediments/cs/upload/evaluationguide.pdf

b) NOAA- http://response/restoration.noaa.gov/cpr/sediment/squirt/squirt.html

c) Region 6- http://rais.ornl.gov/tools/eco_search.php

d) Suggested methods reported in USEPA, 1995, "QA/QC Guidance for Sediment and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluations" (http://water.epa/gov/polwaste/sediments/cs/upload/evaluationguide.pdf). Any method that can achieve these TDLs is acceptable, provided the appropriate documentation of the method performance is generated for the project and the method is adequately identified and described in the SAP.

e) PCB congener TDLs are reported from the Southeast Regional Implementation Manual (2008) (http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100FTIH.TXT). Analysis of 209 congeners for fingerprinting.

f) Selenium shall be reported as Total Recoverable Concentrations

g) Organotin TDLs are reported from the Souteast Regional Implementation Manual (2008). For example, sites with historic sandblasting, shipbreaking, maintenance, and repair would warrant analysis of organotins.

h) Dioxins/Furans TDLs are reported from Galveston Harbor and Channel and HSC Table A-2

Table 9: Tier I Soil PCLs for Human Health Screening [Total Combined, Residential and Commerical/Industrial] for Speical Land Use/History COCs and Parameters, Private Dredging Application

Chemical	CAS #	Units	Screening Benchmarks [a]	
			Residential [b]	Commercial/Industrial [c]
Polychlorinated Biphenyls [d]				
Polychlorinated Biphenyls- 209 congeners	-	ug/kg	1.1E+00	7.1E+00
Metals				
Chromium (3+)	7440-47-3 (III)	mg/kg	2.7E+04	7.5E+04
Chromium (6+)	7440-47-3 (Cr6+)	mg/kg	1.2E+02	1.0E+03
Selenium [e]	7782-49-2	mg/kg	3.1E+02	4.9E+03
Organotin				
Dibutyltin	1002-53-5	ug/kg	-	-
Monobutyltin	78763-54-9	ug/kg	-	-
Tributyltin	688-73-3	mg/kg	2.0E+01	2.0E+02
Miscellaneous Parameters				
Cyanides	57-12-5	mg/kg	4.3E+01	2.83E+02
Dioxins/Furans				
2,3,7,8 -TCDD	1746-01-6	pg/g	-	-
1,2,3,7,8 - PeCDD	40321-76-4	pg/g	-	-
1,2,3,4,7,8 - HxCDD	39227-28-6	pg/g	-	-
1,2,3,6,7,8 - HxCDD	57653-85-7	pg/g	-	-
1,2,3,7,8,9 - HxCDD	19408-74-3	pg/g	-	-
1,2,3,4,6,7,8 - HpCDD	35822-46-9	pg/g	-	-
OCDD	3268-87-9	pg/g	-	-
2,3,7,8 - TCDF	51207-31-9	pg/g	-	-
1,2,3,7,8 - PeCDF	57117-41-6	pg/g	-	-
2,3,4,7,8 - PeCDF	57117-31-4	pg/g	-	-
1,2,3,4,7,8 - HxCDF	70648-26-9	pg/g	-	-
1,2,3,6,7,8 - HxCDF	57117-44-9	pg/g	-	-
2,3,4,6,7,8 - HxCDF	60851-34-5	pg/g	-	-
1,2,3,7,8,9 - HxCDF	72918-21-9	pg/g	-	-
1,2,3,4,6,7,8 - HpCDF	67562-39-4	pg/g	-	-
1,2,3,4,7,8,9 - HpCDF	55673-89-7	pg/g	-	-
OCDF	39001-02-0	pg/g	-	-
Total Dioxin TEQ (2,3,7,8,-TCDD TEQ)	-	pg/g	1.0E+03	5.0E+03

Footnotes:

a) TCEQ Texas Risk Reduction Program (TRRP-http://www.tceq.texas.gov/remediation/trrp/guidance.html); lowest values are reported from 0.5 acre and 30 acre carcinogenic and noncarcinogenic values.

b) TRRP Table 4- Residential total soil combined include inhalation, ingestion, dermal, and vegetable consumption pathways.

c) TRRP Table 5- Commercial/Industrial total soil combined include inhalation, ingestion, and dermal pathways.

d) Analysis of 209 congeners for fingerprinting.

e) Selenium shall be reported as Total Recoverable Concentrations

Table 10: Ecological Benchmarks for Soil for Special Land Use/History COCs and Parameters, Private Dredging Application

Chemical	CAS #	Units	Median Background	Screening Benchmarks			
				TCEQ [a]		EcoSSL [b]	
				Earthworms	Plants	Avian	Mammal
Polychlorinated Biphenyls [c]							
Polychlorinated Biphenyls- 209 congeners	-	ug/kg	-	-	4.00E+01	-	-
Metals							
Chromium (3+)	7440-47-3 (III)	mg/kg	-	-	-	26	34
Chromium (6+)	7440-47-3 (Cr6+)	mg/kg	-	-	-	-	130
Selenium [d]	7782-49-2	mg/kg	3.00E-01	4.10E+00	5.20E-01	1.20E+00	6.30E-01
Organotin							
Dibutyltin	1002-53-5	ug/kg	-	-	-	-	-
Monobutyltin	78763-54-9	ug/kg	-	-	-	-	-
Tributyltin	688-73-3	ug/kg	-	-	-	-	-
Miscellaneous Parameters							
Cyanides	57-12-5	mg/kg	-	-	-	-	-
Dioxins/Furans							
2,3,7,8 -TCDD	1746-01-6	pg/g	-	-	-	-	-
1,2,3,7,8 - PeCDD	40321-76-4	pg/g	-	-	-	-	-
1,2,3,4,7,8 - HxCDD	39227-28-6	pg/g	-	-	-	-	-
1,2,3,6,7,8 - HxCDD	57653-85-7	pg/g	-	-	-	-	-
1,2,3,7,8,9 - HxCDD	19408-74-3	pg/g	-	-	-	-	-
1,2,3,4,6,7,8 - HpCDD	35822-46-9	pg/g	-	-	-	-	-
OCDD	3268-87-9	pg/g	-	-	-	-	-
2,3,7,8 - TCDF	51207-31-9	pg/g	-	-	-	-	-
1,2,3,7,8 - PeCDF	57117-41-6	pg/g	-	-	-	-	-
2,3,4,7,8 - PeCDF	57117-31-4	pg/g	-	-	-	-	-
1,2,3,4,7,8 - HxCDF	70648-26-9	pg/g	-	-	-	-	-
1,2,3,6,7,8 - HxCDF	57117-44-9	pg/g	-	-	-	-	-
2,3,4,6,7,8 - HxCDF	60851-34-5	pg/g	-	-	-	-	-
1,2,3,7,8,9 - HxCDF	72918-21-9	pg/g	-	-	-	-	-
1,2,3,4,6,7,8 - HpCDF	67562-39-4	pg/g	-	-	-	-	-
1,2,3,4,7,8,9 - HpCDF	55673-89-7	pg/g	-	-	-	-	-
OCDF	39001-02-0	pg/g	-	-	-	-	-
Total Dioxin TEQ (2,3,7,8,-TCDD TEQ)	-	pg/g	-	-	-	-	-

Footnotes:

a) TCEQ: Conducting Ecological Risk Assessments at Remediation Sites in Texas (2014) (http://www.tceq.texas.gov/remediation/eco/eco.html)

b) USEPA Eco-SSL: http://www.epa.gov/ecotox/ecossl/

c) Analysis of 209 congeners for fingerprinting.

d) Selenium shall be reported as Total Recoverable Concentrations