SAN FRANCISCO DISTRICT

US Army Corps of Engineers

PUBLIC NOTICE

Regulatory Branch
211 Main Street
San Francisco, Ca. 94105-1905

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DATE: 1 February 1993

TESTING GUIDELINES FOR DREDGED MATERIAL DISPOSAL AT SAN FRANCISCO BAY SITES

1. The U.S. Army Corps of Engineers San Francisco District (Corps), the U.S. Environmental Protection Agency Region 9 (EPA), the San Francisco Bay Regional Water Quality Control Board (RWQCB), and the San Francisco Bay Conservation and Development Commission (BCDC) are developing a Long Term Management Strategy (LTMS) for Bay area dredging and disposal activities. The LTMS is designed to provide appropriate dredged material disposal alternatives for a fifty-year planning horizon through designation of multi-user ocean, in-Bay, and upland disposal sites and identification of beneficial reuse options. The LTMS will also develop site management plans and interpretation guidelines for determining when dredged material is suitable for disposal at any of the designated sites. Implementation of LTMS management programs is scheduled to begin in August, 1994. However, in the interim, continued dredging and dredged material disposal will be necessary at the three existing in-Bay disposal sites [Carquinez Strait (SF-9), San Pablo Bay (SF-10), and Alcatraz (SF-11)].

2. In order to manage the existing in-Bay sites to minimize the potential for dredged material disposal to result in significant contaminant impacts to aquatic resources and uses, the Corps, EPA, RWQCB, and BCDC published and proposed interim testing guidelines as Public Notice No. 92-5 on 9 June 1992. Comments were received and evaluated, and revisions incorporated in the present notice.These testing guidelines are designed to ensure that sufficient information is available to adequately characterize each dredging project so that disposal does not result in chemical or biological degradation of the existing sites. They will apply to dredged material proposed for open water disposal until superseded by implementation of the LTMS program. These guidelines replace those contained in Corps Public Notice 87-1 (released in June, 1987 by the Corps, EPA, and RWQCB).

3. These guidelines contain two major revisions to Public Notice 87-1:

a) early guidance to applicants as to the chemical and biological sediment testing that is appropriate for their specific project(s) based on a review of existing information.

b) use of the "Alcatraz Environs" (a series of stations outside but contiguous to the direct deposition zone of the Alcatraz site) as the reference for determining suitability for disposal at the Alcatraz site. Systematic review of existing information for Bay area dredging projects has already been initiated and was announced in a joint letter from the Corps, RWQCB, and BCDC dated December 18, 1991.The use of Alcatraz Environs as the reference for determining whether material may be disposed at the Alcatraz site is, however, a change from past practice.

4. Under these testing guidelines, applicants will no longer routinely test sediments from the Alcatraz disposal site for comparison with the material they propose to dredge. Instead, their material will be compared against Alcatraz Environs sediments. Comprehensive chemical and biological testing of the Alcatraz Environs has been conducted by the Corps. This testing confirmed that the Alcatraz Environs area has significantly lower levels of contaminants than recent samples from the Alcatraz disposal site itself. The agencies will use these data as the reference for dredging projects proposing disposal at the Alcatraz site (SF-11). This approach is intended to reduce the variability in reference site data caused by ongoing disposal operations, and will also help to offset the costs of otherwise increased sediment testing. Applicants may

also choose to sample and test Alcatraz Environs sediments directly; however, their data must be comparable in quality to that in the reference area database. Reference data for the other existing in-Bay disposal sites (SF-9 and SF-10) may be established and published in a similar manner. Applicants proposing to use these other sites should continue to contact the Corps and RWQCB directly for testing direction. The reference area database may be supplemented with additional data in the future as appropriate. Applicants may propose to conduct testing using approved methods or organisms other than those in the Corps' reference area data set, but in order to do so they must also generate appropriate data for the reference area that is comparable in quality to that in the existing reference area database. Therefore, any such proposals should be fully coordinated with the agencies in advance. Through LTMS, the agencies are developing a methods manual that will contain detailed protocols for conducting sediment tests.

5. The initial reference area data set for the Alcatraz disposal site are enclosed with this Public Notice. As additional data become available, they will be periodically reviewed for comparability with and inclusion in the reference area database. The Corps will publish any new reference area data to be used under these testing guidelines as appropriate. However, it is the applicant's responsibility to obtain the most recent reference area data from the Corps.

6. Nothing in these testing guidelines affects any regulatory or resource agency's existing authorities, nor their ability to comment on proposed projects. Similarly, these testing guidelines do not alter current policies governing management of existing disposal sites (e.g., monthly and yearly discharge volume restrictions) or the need to develop alternative disposal sites and methods. Meeting these testing guidelines does not by itself guarantee that a permit to discharge dredged material will be issued, and does not eliminate the need to obtain any other applicable state or federal permits or authorizations. The testing guidelines will be applied by the Corps and EPA to project applications received after the date of this Public Notice, and the State will begin it's adoption process at the same time. These guidelines will remain in effect until replaced by implementation of LTMS dredged material management programs or superseded by changes in state or federal law.

7. For further information, contact:

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DREDGED MATERIAL TESTING GUIDELINES

The Corps, EPA, RWQCB, and BCDC are providing these testing guidelines for dredged material proposed for disposal at existing San Francisco Bay sites. These testing guidelines will be in place until more comprehensive dredged material management programs are developed on a National or State-wide basis, or implemented through the LTMS. Meeting these guidelines does not by itself guarantee that a discharge permit will be issued by any of the agencies. Also, this testing guidance does not necessarily apply to other types of disposal actions, such as ocean disposal under Section 103 of the Marine Protection, Research, and Sanctuaries Act, or confined disposal at upland or aquatic sites.

Additional information about use of these testing guidelines is provided in a separate document, "Response to Comments on Public Notice 92-5".

TIER I.

Determine the Need for Testing

The agencies will review any existing information provided in response to the December 18, 1991 joint Corps/RWQCB/BCDC letter (Identification of Dredging and Disposal Needs), as well as any supplements or other available information. This information will be evaluated against the criteria listed in the Clean Water Act 404(b)(1) guidelines [40 CFR Section 230.60] to determine whether the material to be dredged may be excluded from testing. As provided for in 40 CFR Section 230.60(a):

"If the evaluation ... indicates the dredged or fill material is not a carrier of contaminants, then the required determinations pertaining to the presence and effects of contaminants can be made without testing. Dredged or fill material is most likely to be free from chemical, biological, or other pollutants where it is composed primarily of sand, gravel, or other naturally occurring inert material. Dredged material so composed is generally found in areas of high current or wave energy such as streams with shifting bars and channels. However, when such material is discolored or contains other indications that contaminants may be present, further inquiry should be made".

Even if material is not excluded from testing overall, additional testing may not be necessary in a particular case if adequate data are available to establish that the material is unlikely to result in an unacceptable adverse effect on the aquatic ecosystem (e.g., where several years of past testing data show that the material has always met current suitability guidelines) and there is no reason to believe conditions have changed. (This evaluation corresponds to the "Tier I" assessment in Public Notice 87-1.)

TIER II.

Testing Program

If testing exclusions do not apply, and if existing information is not sufficient to evaluate the effects of a proposed discharge, project-specific evaluations, including both chemical and biological sampling and testing, should be performed in accordance with these testing guidelines. (These evaluations are similar to "Tier II" and "Tier III" assessments in Public Notice 87-1.) Proposals to use results of testing that differs from these guidelines will be considered on a case-by-case basis, and should be approved in advance. Data generated by this testing program should be submitted using the reporting format attached to this Notice, at the time of permit application. All applicable Quality Assurance/Quality Control procedures should be reported, including laboratory documentation as appropriate. As part of the LTMS program, the agencies are developing a reporting format for electronic data submittals that should expedite the permit application process in the future.

1. Minimum Sediment Sampling guidelines. Table 1 outlines the minimum number of sediment samples that should be collected, and tests that should be performed, for routine dredging projects. *However, a sampling and analysis plan should be coordinated with the agencies before any sampling or testing begins.* Station locations for the Alcatraz Environs are provided in Table 2.

Note: physical, chemical and biological testing should be conducted on sediment samples collected at the same time.

2. Sediment Compositing Guidelines. Compositing sediment samples from an area into a smaller number of samples is allowed for testing purposes. However, careful consideration should be given to the compositing scheme for any project. Sediment samples should only be composited together: 1) when they are from a contiguous portion of the project area; 2) when there is reason to believe that sediments throughout the portion of the project area are similar and are exposed to the same influences and pollutant sources, if any, such that the composited sample is representative of the entire area. In all cases, specific compositing schemes should be reported and the rationale used fully described.

3. Physical and Chemical Evaluations. Sediment physical and chemical tests are conducted at a minimum on each composite sample; however, greater information for decision making is available when the individual core samples are also evaluated. Routine sediment physical and chemical analyses should be performed for the list of contaminants of

concern given in Table 3. Analysis for other compounds may also be required on a case-by-case basis.

4. Biological Evaluations. Both suspended particulate phase and solid phase acute toxicity bioassays are performed in routine Tier II evaluations. Bioassays are generally conducted on composite sediment samples only. Note that the initial reference area database includes results for only some potential test species. Applicants may propose to conduct their own reference site sampling, or to use other test organisms, but species choice must be approved and testing must generate appropriate data for the reference area that is of acceptable quality to the agencies. Therefore, any such proposals should be fully coordinated with the agencies in advance.

Suspended Particulate Phase acute bioassays assess the effects of an elutriate of the dredged material on bivalve or echinoderm larvae, following the basic protocols of ASTM (E 724-89), 1991, or EPA Standard Operating Procedure 1.03.007, 1990 respectively. Elutriate is prepared according to the Green Book (EPA/Corps 1991) and bioassays use a minimum of four elutriate concentrations (100%, 50%, 10%, and 1%). Endpoints are mortality and abnormal development. Separate counts for each are to be reported. Suspended particulate phase bioassay results are used primarily to evaluate water quality standards compliance, after allowance for appropriate mixing at the disposal site. (For guidance on performing mixing zone calculations see EPA /Corps 1991 or updates.) In addition, this bioassay provides information useful in the overall evaluation of potential sediment toxicity.

Solid Phase acute bioassays assess the effects of the dredged material on organisms that live in direct contact with the sediment. Solid phase acute bioassays conducted under these testing guidelines for routine projects should use an approved amphipod species in 10-day exposures, following the protocol of ASTM (E 1367-90), 1991. A list of currently approved species and their initial reference sediment survival data are available from the Corps. The primary endpoint is mortality, but post exposure reburial success should also be measured. Results of solid phase acute bioassays are compared to the reference area data set for the same species, and results are generally considered to be acceptable when average mortality in the material to be dredged does not exceed mortality in the most current reference area data set by 20 percent or more. An applicant may also choose to test the reference area sediment directly. In this case a statistical comparison is made. Sediments are considered to be acutely toxic if mortality is statistically significant and exceeds reference sediment mortality by 20 percent or more.

TIER III.

Special Evaluations

In those cases where the routine physical, chemical and biological evaluations described in the preceding paragraphs do not provide sufficient information to evaluate the potential effects of a proposed discharge, more comprehensive case-specific evaluations may be required by the agencies. In such cases, special evaluations may entail: more intensive sediment sampling; bioaccumulation testing; bioassays with more species than routinely required; field surveys of biological communities; or other specific assessments as required.

Table 1. Minimum Sediment Sampling guidelines

DREDGE VOLUME* (Cubic yards)	TOTAL # SAMPLES	# SAMPLES PER COMPOSITE	TOTAL # TESTS
5,000 - 20,000	4	4	1
20,000 - 100,000	8	4	2
100,000 - 200,000	12	4	3
200,000 - 300,000	16	4	4
300,000 - 400,000	20	4	5
400,000 - 500,000	24	4	6

* Note: For project volumes less than 5,000 cubic yards or greater than 500,000 cubic yards, the total number of tests and corresponding samples will be determined on a case-by-case basis.

Table 2. Alcatraz Environs Station Locations

Station	Coordinates (Lat., Long.)		Station	Coordinates (Lat., Long.)	
R-AM-A	37°49.75'N	122°25.88'W	R-AM-F	37°49.27'N	122°24.90'W
R-AM-B	37°49.75'N	122°25.57'W	R-AM-G	37°48.83'N	122°25.88'W
R-AM-C	37°49.75'N	122°24.90'W	R-AM-H	37°48.83'N	122°25.57'W
R-AM-D	37°49.27'N	122°25.88'W	R-AM-I	37°48.83'N	122°24.90'W

Table 3. Routine Sediment Physical and Chemical Analyses

Parameter	Detection Limit[1]
Conventionals:	
Grain Size	NA
Total Organic Carbon	0.1%
TRPH	20
Total Volatile Solids	0.1%
Total and Water Soluble Sulfides	0.1
Total Solids/Water Content	0.1%
Metals:	
Ag	0.1
As	0.1
Cd	0.1
Cr	0.1
Cu	0.1
Hg	0.02
Ni	0.1
Pb	0.1
Se	0.1
Zn	1.0
Organic Compounds:	
Phthalate esters	0.01
PAHs [2]	0.02
PCBs [3]	0.02
Pesticides [4]	0.002
Butyltins [5]	0.001

1. Reported as mg/kg dry wt., unless otherwise noted
2. All compounds on EPA Method 610 list.
3. Reported as Arcolor equivalents 1242, 1248, 1254, 1260 and total PCB.
4. All compounds on EPA Method 608 list.
5. Mono-, Di-, and Tributyltin.

RECOMMENDED SEDIMENT TESTING REPORT FORMAT

For Routine Testing Conducted in Accordance with the
"Testing Guidelines for Dredged Material Disposal
at San Francisco Bay Sites"

Include cover sheet with name of project, report preparer, and date.

I. Introduction
   a. Project purpose
   b. Location and area to be dredged
   c. Project depth, overdredge depth, and disposal volumes
   d. Brief history of dredging at the site, and summaries of or reference to any past sediment test data

II. Methods (written summary)[1]
   a. Sediment collection - include dates of collection, location, depth, and compositing scheme, if any
   b. Physical analyses
   c. Chemical analyses
   d. Bioassay procedures
   e. Quality assurance/quality control (QA/QC) procedures
   f. Statistical methods
   g. Limiting permissible concentration (LPC) calculation

III. Results (summary data and discussion)[2]
   a. Physical analyses
   b. Chemical analyses
   c. Bioassay results

IV. References Cited

V. Appendix A - detailed sediment physical and chemical data, and QA/QC

VI. Appendix B - detailed sediment bioassay data and QA/QC

1. Attach to Section II maps and cross sections of dredging area (and reference area, if applicable) showing sample collection points, and coring logs.

2. Attach summary tables of results.

ALCATRAZ ENVIRONS SEDIMENT CHARACTERIZATION

Summary of Available Reference Sediment Testing (Nov 92)[1]

Physical & Chemical

Grain Size (%)	A	B	C	D	E
Gravel (>2,000μm)	4	0	0	17	3
Sand (62.5 - 2,000μm)	94	91	98	81	97
Silt (3.9 - 62.5μm)	1	3	1	1	0
Clay (<3.9μm)	1	6	1	1	0

Conventionals					
Total Organic Carbon (%)	0.07	0.19	0.03	0.11	0.14
Oil & Grease (ppm)	13.00	ND	3.59	1.22	175.14
Total Volatile Solids (%)	2.13	2.10	1.32	—	2.60
Total Petroleum (ppm) Hydrocarbons	<0.60	8.00	2.63	<11.50	—

Metals (ppm dry)	A	B	C	D	E
Arsenic	13.20	6.55	5.83	8.54	1.80
Cadmium	0.35	0.09	0.046	0.040	0.02
Chromium	121.00	156.00	113.00	53.80	19.80
Copper	11.40	12.40	7.90	3.10	2.70
Lead	11.00	14.40	14.20	7.01	2.30
Mecury	0.048	0.156	0.036	0.041	0.01
Nickel	38.80	40.70	33.50	30.80	12.3
Selenium	ND	ND	ND	<0.50	0.41
Silver	0.02	0.033	0.048	<0.08	0.10
Zinc	35.40	37.70	106.80	21.80	12.00

Butyltins (ppb dry)	A	B	C	D	E
Monobutyltins	ND	ND	ND	<1.1	<1.3
Dibutyltins	0.6	ND	ND	<1.1	<1.3
Tributyltins	1.0	1.1	ND	<1.1	<1.3
PCB's	ND	ND	ND	ND	ND
Chlorinated Pesticides	ND	ND	ND	ND	ND

Polynuclear Aromatic Hydrocarbons (PAH's total)					
Low molecular wt (ppb)	45	374	12-14	300	ND
High molecular wt.(ppb).	73	1246	15-31	1000	128

1. A = Battelle, January 1992. Phase III of Oakland Harbor 38 Foot Project.
   B = Battelle, June 1992. Phase III B of Oakland Harbor 42 Foot Project.
   C = Battelle, September 1992. Phase III A of Oakland Harbor 42 Foot Project.
   D = MEC, July 1992 - Oakland berths 7,8,9 & 25.
   E = MEC, Oct 1992 - Port of San Francisco Berth 35E

ALCATRAZ ENVIRONS SEDIMENT CHARACTERIZATION

Summary of Available Reference Sediment Testing (Nov 92)[1]

Bioassay Results

Solid Phase (%survival)	A	B	C	D	E	Average
Amphipod(*Ampelisca abdita*)	—	—	—	89	94	92
Amphipod (*Rhepoxinius abronius*)	86	98	93	97	—	93
Polychaete worm (*Nephtys caecoides*)	92	99	92	—	—	94
Suspended Particulate Phase (LC50)(%)						
Mussel larvae (*Mytilus edulis*)	—	>100	—	—	—	
Oyster larvae (*Crassostrea gigas*)	>100	>100	>100	—	>100	
[2]Bioaccumulation Exposures Conducted for :						
Bentnose clam (*Macoma nasuta*)	X	X	X	—	—	
Polychaete worms (*Nephtys caecoides*)	X	X	X	—	—	

1. A = Battelle, January 1992. Phase III of Oakland Harbor 38 Foot Project.
   B = Battelle, June 1992. Phase III B of Oakland Harbor 42 Foot Project.
   C = Battelle, September 1992. Phase III A of Oakland Harbor 42 Foot Project.
   D = MEC, July 1992 - Oakland berths 7,8,9 & 25.
   E = MEC, Oct 1992 - Port of San Francisco, Berth 35E.

2. Data available upon request.

US Army Corps
of Engineers
San Francisco District

RESPONSE TO COMMENTS ON PUBLIC NOTICE 92-5

Public Notice 92-5 was published on 9 June, 1992, and distributed to approximately 1000 groups and individuals on the Corps of Engineers San Francisco District mailing list. In addition, the agencies met informally on 29 June, 1992, with representatives from several Bay area ports, testing consultants, and environmental groups, at their request, to explain the proposed testing guidelines and answer preliminary questions. Nine sets of written comments were received. Comments could be grouped into six general categories, including: 1) Reference Area Issues; 2) Tiered Approach to Testing; 3) Sediment Sampling Issues; 4) Solid Phase Bioassays; 5) Interpretation of Test Results; and 6) Other Issues. The agencies' responses to the comments received are presented below, and finalized testing guidelines are published by the agencies as Public Notice 93-2.

I. REFERENCE AREA ISSUES

a. *Alcatraz Environs chemistry values are not pass/fail standards*

Many of those commenting were concerned that the chemical values presented in the Public Notice were being proposed for use as pass/fail standards. One commentor noted that sediment quality standards similar to water quality standards have not yet been established on a national or statewide basis, and that to create such standards for the Bay would be "ahead of the science." Other commentors were concerned that the Alcatraz Environs values are so low that, if used as pass/fail standards, few area dredging projects would be able to meet them. The agencies do not propose to use the Alcatraz Environs chemistry values as pass/fail standards or criteria. The purpose for publishing the initial Alcatraz Environs chemistry was to characterize the site and confirm that the area is less contaminated than the Alcatraz disposal site. In most cases bioassay responses, as indicators of potential toxicity, will determine the effect of a proposed discharge of dredged material on the receiving aquatic ecosystem. However, depending on the contaminants of concern and other factors, elevated chemistry could independently indicate the need for more than the routine Tier II testing described in the testing guidelines.

b. *Normalization of PAHs to total organic carbon*

Several commentors noted the difference in total organic carbon (TOC) content between the Alcatraz Environs reference area and sediments from typical dredging projects in the Bay area. These commentors recommended normalizing the concentrations of polynuclear aromatic hydrocarbons (PAHs) to the organic carbon content of the reference sediment to account for this difference. Normalization to TOC would have the effect of lowering the apparent (relative) concentration of PAHs in the project sediment.

As noted above, the agencies do not propose to use Alcatraz Environs chemistry values as pass/fail standards or criteria. In this regard, normalization to TOC is unnecessary. However, measurement of TOC (and other parameters) is routinely required under the testing guidelines. This can help to identify sediments that are enriched with respect to organic carbon, and that therefore may warrant more than routine testing. This also allows normalization to TOC in those situations where it may be beneficial. However, non-TOC normalized values should be reported.

c. *Sediment grain size*

Several commentors noted that the Alcatraz Environs sediment is primarily sand, whereas most material dredged in the Bay has substantial proportions of silts and clays. A particular concern was that test organism mortality in a fine-grained dredged material may be interpreted as indicating chemical toxicity, yet may only be a "normal" effect of exposing the organism to a less than optimal physical environment. Overall, the commentors felt that the grain size difference made the Alcatraz Environs a questionable reference area.

The agencies acknowledge that Alcatraz Environs sediment is more coarse-grained than much of the material dredged from the Bay. However, for the species of test organisms recommended for use in Tier II bioassays, standardized allowances are made to account for potential effects of grain size differences. In particular, for amphipods mortality is not considered to be excessive until it is 20 percent or more above that in the reference sediment. Although the true effect of grain size, if any, will vary from project to project, the 20 percent figure is well established in the scientific literature, and is reflected in accepted protocols for these organisms (EPA/ Corps 1991 "Green Book").

d. *Periodic sampling/updating of reference area data*

Various commentors requested more information about how often and by whom the Alcatraz Environs reference area would be retested, and how the new data would be used. Some suggested that the Corps of Engineers should routinely retest the reference area, while others asked whether and how applicant-collected reference area test data could also be incorporated in the overall database.

The agencies intend to periodically update the reference area

database with all available and appropriate data from direct testing of Alcatraz Environs sediment. The review and updating process will include available data collected by both agencies and by applicants. These data will not be combined or averaged together (see response I(a), "Alcatraz Environs chemistry values are not pass/fail standards"). However, acceptable new solid phase bioassay responses (for each species) will be averaged with existing data to determine the appropriate values against which applicants may compare their own test results during the subsequent period. Updated data, including the new reference values, will be published by the Corps of Engineers. At this time, it is anticipated that test results will be reviewed and the database updated on at least an annual basis.

e. *Availability of Alcatraz Environs data*

Some commentors requested that the Alcatraz Environs testing data on which the Public Notice was based be made available for review. The Public Notice provided only a summary of physical, chemical, and biological testing from one study.

It is not possible in the Public Notice itself to include large volumes of testing data. Public Notice 92-5 summarized pertinent results from testing conducted for the Port of Oakland -38-foot Deepening Project (Battelle, 1992). However, these data, along with additional data that became available for incorporation in the testing guidelines (see response IV(a), "Species allowable in solid phase bioassays", and the Table attached to Public Notice 92-7) are all available for public review through the Corps of Engineers.

f. *Alcatraz Environs station coordinates should be listed*

The latitude-longitude coordinates for each of the eight Alcatraz Environs stations are now listed in the testing guidelines.

g. *Establish "environs" reference data for other disposal sites*

Most dredged material disposal in the region currently occurs at the Alcatraz disposal site (SF-11). However, the agencies are considering the need to collect "environs" data for the existing San Pablo Bay and Carquinez Straits disposal sites (SF-10 and SF-9, respectively). Until such data are published by the Corps, applicants proposing to dispose at either of these sites will continue to directly sample and test disposal site sediment for reference purposes.

II. TIERED APPROACH TO TESTING

a. *May sediment evaluations begin at any Tier?*

In general, an applicant may begin testing at any Tier. However, the information available for decision making must be sufficient to satisfy the requirements of all prior Tiers. To minimize the potential that expensive retesting may be required, applicants are strongly encouraged to hold a preapplication meeting with the agencies to coordinate sampling plans prior to initiating any testing program.

b. *Clarify when the Tier I exclusion applies*

In some cases, Tier I information may be sufficient for agency decision making. Circumstances under which the federal agencies may not require additional testing are specified in Subpart G of the 404(b)(1) Guidelines [40 CFR Part 230.60 (a)], as follows:

If the evaluation under paragraph (b) indicates the dredged or fill material is not a carrier of contaminants, then the required determinations pertaining to the presence and effects of contaminants can be made without testing. Dredged or fill material is most likely to be free from chemical, biological, or other pollutants where it is composed primarily of sand, gravel, or other naturally occurring inert material. Dredged material so composed is generally found in areas of high current or wave energy such as streams with large bed loads or coastal areas with shifting bars and channels. However, when such material is discolored or contains other indications that contaminants may be present, further inquiry should be made.

Note that the State of California may also require additional testing in some cases. In any event, the decision to exclude a project from additional testing is made by the agencies, not the applicant.

c. *Clarify when Tier III (non-routine) testing is required*

Tier III testing will be required when the Tier II testing methods outlined in the testing guidelines do not provide sufficient information for the agencies to evaluate the effects of proposed discharges of dredged material. This evaluation is made by the agencies upon review of Tier I or Tier II data, and on a case-by-case basis. It is expected that testing in Tier II will be sufficient for the majority of dredging projects in the Bay area. Tier III testing may be indicated in a variety of circumstances, for example: when aquatic disposal is proposed for dredged material having elevated levels of contaminants that may bioaccumulate or biomagnify, but which show little acute toxicity; when project-specific circumstances are such that routine Tier II testing is not expected to generate sufficient or appropriate information; when excessive (>20 percent) mortality occurs in a solid phase bioassay, and the applicant elects to conduct a more complete Tier III characterization of the sediment in order to confirm or refute the Tier II results; or when an applicant proposes to initiate testing at this Tier. All Tier III testing programs are designed especially to address project-specific issues, and therefore should be developed in close coordination with the agencies.

III. SEDIMENT SAMPLING ISSUES

a. *Minimum number of sediment samples and composites*

Some reviewers pointed out that Public Notice 92-5 contained errors in the table showing minimum numbers of individual core samples, and composited test samples, for different

size dredging projects. Public Notice 93-2 includes corrected numbers. In all cases, composited test samples (if any) are comprised of at least four (4) individual core samples.

One commentor was concerned that too few test treatments (composites) were required for large projects (over 200,000 cubic yards). The agencies agree, and have adjusted the minimum number of tests required for larger projects.

b. *Increased cost of expanded testing - small project concern*

One commentor was concerned that including a solid phase bioassay in Tier II testing programs would be a substantial burden for small projects, and recommended a testing exemption in such cases.

The agencies acknowledge that testing costs can be substantial. Although no blanket exemption from testing is given because even relatively small projects can be significant carriers of contamination, sensitivity to cost is built into the testing guidelines in several respects, including:

- The guidelines use a tiered testing approach designed to generate only as much information as necessary for decision making on a project-by-project basis
- Applicants may compare their test results to the agencies' published reference area data, rather than incurring the costs of sampling and testing the reference area directly for every dredging project
- Smaller projects are allowed to take fewer sediment samples and conduct fewer tests, in routine circumstances
- Testing for very small projects (<5,000 cubic yards) is determined by the agencies on a case-by-case basis
- The guidelines provide for compositing individual sediment samples into fewer test treatments for bioassays
- Some projects may be excluded from additional testing, based on previous information or testing [per 40 CFR Part 230.60]

c. *Clarify when/how sample compositing is appropriate*

Several individual sediment samples may be combined into fewer composites for biological testing, as outlined in the testing guidelines. Compositing saves costs by allowing a single test to characterize a larger volume of dredged material. However, compositing should be considered carefully for each project if it is to facilitate agency evaluations while minimizing erroneous results. Individual sediment samples should only be composited together when they are from contiguous portions of the project area, and when they are expected to be physically and chemically similar to each other. This may be the case, for example, when the sample locations are hydrographically similar, and subject to similar uses and sources of pollution. In general, less compositing and/or additional sampling is appropriate in locations subject to known sources of contamination, such as heavily industrialized areas, or where existing information indicates the likelihood of contamination. Note that, where an obvious sediment horizon (vertical stratification) exists, individual core samples may need to be split into discreet vertical layers before compositing occurs; the composited layers would be evaluated as separate test treatments. In all cases, testing reports should include a full description of and rationale for the specific compositing scheme used on a project.

d. *Necessary quality of new reference area data*

The agencies will review any new reference area data proposed for inclusion in the reference area database, including data from testing of bioassay species not part of the initial or current database. If determined by the agencies to be appropriate and of acceptable quality relative to the existing data, the new data will be made a part of the overall database for use during the subsequent period.

The agencies will evaluate data quality with respect to: field, laboratory, and analytical methods; achieved detection limits; organism responses in control and reference sediments and with reference toxicants; and other relevant factors.

IV. SOLID PHASE BIOASSAYS

a *Species allowable for use in solid phase bioassays*

Several commentors noted that Public Notice 92-5 was not sufficiently clear about when amphipod species other than *Rhepoxinius abronius* could be used in routine testing. Different commentors advocated *Ampelisca abdita* and *Eohaustorius estuarius* as alternates that should be available, since each species has been successfully used in regulatory programs and standardized laboratory protocols have been developed for them.

As stated in the testing guidelines, amphipods other than *Rhepoxinius* may be approved by the agencies for testing. However, at the time of Public Notice 92-5, only *Rhepoxinius* had been tested using Alcatraz Environs sediment. Since Public Notice 92-5 was published, Alcatraz Environs reference data have become available for *Ampelisca abdita*, as well as additional testing data for *Rhepoxinius*. Data for additional species may also be allowed under the testing guidelines in the future. The currently approved list of species, along with their average survival values in reference sediment, may be obtained from the Corps of Engineers.

Generally, test results will be compared with the respective percent survival values in the most recent reference area data set (updated values are to be published periodically). If an applicant proposes to use species other than those listed, the testing plan should include collection and testing of reference area sediment, with statistical comparison of the dredged material to the reference sediment. Of course, any applicant may elect to collect and test Alcatraz Environs reference sediment directly, and to statistically compare responses in the dredged material samples to the reference response.

b. *Report reburial data from amphipod bioassays*

Reburial success of amphipods following 10-day sediment exposure can be a useful indicator of potential

stress. This measure may be especially important when amphipod responses in control, test, or reference sediments are marginal. The agencies agree that reburial success should be observed and reported for amphipod bioassays, and have included reburial in the testing guidelines. However, mortality remains the primary endpoint in the bioassay.

c. *Statistical comparison to reference bioassays*

Several commentors stated that Public Notice 92-5 was unclear about the proper statistical procedures to use with solid phase bioassays, and when to use them. Of particular concern was how specifically to compare dredged material test results to pre-existing reference area data.

For solid phase bioassay results, test results from an applicants dredged material are compared directly against the agencies' current published data set for the reference area. The dredged material is considered acutely toxic if amphipod mortality in the dredged material is greater than or equal to the published reference mortality, plus 20 percent. Therefore, if the current published reference mortality is 10 percent (i.e., survival = 90 percent), then dredged material causing 30 percent mortality or above (survival at or below 70 percent) is considered to be acutely toxic.

Although the "published reference plus 20 percent" guideline is a direct comparison, applicants may elect not to use the agencies' published reference data. Any applicant may instead choose to collect samples from the reference area, and to test them directly against their dredged material samples. In this case, appropriate statistical comparisons [as called for in the protocols specific to the bioassay(s) used] must be conducted to determine whether mortality in the dredged material is different from that in the reference sediment. When statistical comparisons are made, dredged material is considered acutely toxic if mortality is both statistically significant and at least 20 percent greater than reference sediment mortality.

V. INTERPRETATION OF TEST RESULTS

a. *How will the four agencies reach permit decisions?*

Nothing in the testing guidelines takes away from or adds to the authorities of any agency. However, the testing guidelines were developed jointly so that the information generated by applicants will be most useful for each agency to reach decisions, under their individual authorities and procedures, for dredging projects. Differing interpretations may still occur from time to time, but the testing guidelines should both reduce the frequency of such occurrences and provide a more predictable framework for generating additional information when needed. In either event, predictability for applicants is enhanced when sampling and testing plans are coordinated with the agencies in advance.

b. *Specific interpretation guidelines should be provided*

The testing guidelines provide a greater degree of predictability for applicants than has been previously available. Applicants electing to compare their data against the published reference area data set will know in advance whether the agencies are likely to consider their dredged material to be acutely toxic. However, every project is different, and factors other than sediment characteristics are considered before a permit is issued. For these reasons, more specific interpretation guidance that could apply to all projects is not possible to outline in the testing guidelines.

c. *Conflicting results: must both bioassays be "passed"?*

The testing guidelines are not a decision making framework by themselves. Rather, testing generates information for decision making by each of the agencies, within their individual procedures and authorities. However, the Tier II bioassays each evaluate different potential effects of a proposed discharge of dredged material: on the water column (suspended particulate phase bioassay with bivalve or echinoderm larvae); and the benthos (solid phase bioassay with amphipods). Therefore, a sediment may be considered to "fail" if either bioassay indicates acute toxicity. [Also see response V(a), above.]

d. *Endpoints in suspended particulate bioassays*

One commentor noted that the definition of and procedure for counting abnormally-developed bivalve (or echinoderm) larvae as described in Public Notice 92-5 were inconsistent with the published scientific protocols. The testing guidelines do call for minor modifications to the published protocols. In particular, separate counts for both normal and abnormal larvae are required. Counts for abnormals and calculated mortalities are to be added (i.e., it is assumed that abnormal larvae will not survive) when evaluating whether control survival is acceptable (>70 percent) and when calculating LC50 concentrations. However, the separate abnormality counts are to be used for calculating EC50 values. Both LC50 and EC50 values, and all counts, are to be included in the testing report.

e. *Mixing zone model for bivalve larvae bioassay results*

Mixing zone calculations should continue to be performed in accordance with the "Green Book" (EPA/Corps, 1991).

VI. OTHER ISSUES

a. *Discretion for testing details not specified in guidelines*

It is the applicant's overall responsibility to ensure that appropriate procedures are followed. In any case, all sampling, testing, and analytical procedures used should be fully documented in the testing report. As a product of the LTMS, a standard testing manual will be available soon that will provide additional guidance on testing details. Nevertheless, when questions arise during testing, guidance should be sought from the agencies.

b. *Implement testing guidelines in draft*

form - do not finalize now

The testing guidelines will be reviewed and updated periodically. This process can result in changes to any aspect of the testing guidelines. Routine updates, including addition of new information to the reference area data set, will be distributed by the Corps of Engineers. Changes that are more substantive in nature, such as a proposal to select a new reference area, would be circulated as a Public Notice and comments considered before finalization. Because the testing guidelines can be modified as necessary in the future, there would be no benefit to retaining them in draft form at this time.

c. *Guidance is needed for sediment that does not "pass"*

Sediments that are found to be unsuitable for in-Bay disposal must be evaluated separately to determine their suitability for other disposal options. The RWQCB is developing guidelines which it will use to classify dredged material for possible disposal in various upland circumstances.

d. *Guidelines are needed for ocean and upland disposal, as well*

Comprehensive guidelines for ocean disposal of dredged material are available in the "Green Book" developed by EPA and the Corps of Engineers. The Green Book was updated in 1991, and the EPA and the Corps of Engineers expect to publish more specific local guidance supplementing the Green Book by early 1993. (Note that an ocean disposal site for Bay area dredged material will be designated in January, 1994.) Regarding guidelines for upland disposal, see response VI(c), above.

e. *Applicants should not pay for Environs database development*

One commentor was concerned that, through the procedures in the testing guidelines, applicants are being asked to underwrite the costs of developing the reference area data set - costs which should be borne by the state and federal governments.

It is important to understand that applicants are no longer required to routinely sample and test the reference area at all. Instead, they may compare to existing data published by the agencies. Therefore, applicants are not being asked to provide data that the government would otherwise collect. However, when an applicant elects to conduct direct testing using reference area sediment (for example, to provide information in support of a proposal to use a new bioassay species), the agencies will review that data for possible inclusion in the data set. It is the intent of the agencies to use all the relevant information available in making decisions about Bay area dredging projects.

f. *Conflict of Alcatraz Environs station with sand mining lease*

The agencies do not expect that the sand mining lease and the presence of one of the reference stations will conflict with each other, due to the dynamic nature of the site. However, the agencies will pay close attention to reference data obtained from this station to ensure that it remains a useful part of the Environs, overall.

g. *Base testing on 404(b)(1) Guidelines, not "Green Book"*

The testing guidelines are specifically designed to be consistent with EPA's §404(b)(1) Guidelines. In particular, the testing guidelines are meant to satisfy Subpart G of the §404(b)(1) Guidelines (as well as the RWQCB and BCDC information needs) for routine projects in the Bay area. The ocean disposal "Green Book" is similar in many respects to the testing procedures of Subpart G; however, the testing guidelines are not based specifically on the Green Book.

h. *Document the disposal site (mound) sediment distribution*

The Corps of Engineers monitors the extent of mounding at the Alcatraz disposal site. The Alcatraz Environs reference stations are outside the disposal site's direct deposition zone. Ongoing monitoring of the mound will be used to confirm the continued appropriateness of the reference stations. Persons interested in the results of this monitoring surveys should contact the Corps.

i. *Status of guidelines once National guidance is issued*

The testing guidelines may be superseded by, or need to be modified for consistency with, any of the following: National §404 testing guidance (a national manual is being developed by the Corps of Engineers and EPA, and should be distributed by 1994); more comprehensive guidelines developed via the LTMS; or promulgation of state or federal sediment quality criteria or standards.