USACE - 1991

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US Army Corps
of Engineers
New York District
26 Federal Plaza
New York, N.Y. 10278
ATTN: Regulatory Branch

Public Notice

In replying refer to:

Public Notice No. 14515-91-1028-OD

Published: 25 NOV 91 Expires: 31 DEC 91

TO WHOM IT MAY CONCERN:

The New York District Corps of Engineers has received an application for a Department of the Army permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403), Section 404 of the Clean Water Act (33 U.S.C. 1344), and Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413).

APPLICANT: **Port Authority of NY and NJ**
One World Trade Center
New York, New York 10048

WORK: **Maintenance dredging with barge overflow and ocean disposal**

WATERWAY: **Reaches B, C, and D of Port Elizabeth/Port Newark in Newark Bay**

LOCATION: **Cities of Elizabeth and Newark, Essex and Union Counties, New Jersey**

A detailed description and plans of the applicant's activity are enclosed to assist in your review.

The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the activity must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the activity will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food production and, in general, the needs and welfare of the people.

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of

an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

ALL COMMENTS REGARDING THE PERMIT APPLICATION MUST BE PREPARED IN WRITING AND MAILED TO REACH THIS OFFICE BEFORE THE EXPIRATION DATE OF THIS NOTICE, otherwise, it will be presumed that there are no objections to the activity.

Any person may request, in writing, before this public notice expires, that a public hearing be held to collect information necessary to consider this application. Requests for public hearings shall state, with particularity, the reasons why a public hearing should be held.

It should be noted that information submitted by mail is considered just as carefully in the permit decision process and bears the same weight as that furnished at a public hearing.

Pursuant to Section 7 of the Endangered Species Act (16 U.S.C. 1531) and based upon a review of the latest published version of the threatened and endangered species listing, a preliminary determination is that the activity under consideration will not affect those species listed or their critical habitat.

Based upon a review of the latest published version of the National Register of Historic Places, there are no known sites eligible for, or included in, the Register within the permit area. Presently unknown archaeological, scientific, prehistorical or historical data may be lost by work accomplished under the required permit.

Reviews of activities pursuant to Section 404 of the Clean Water Act will include application of the guidelines promulgated by the Administrator, U.S. Environmental Protection Agency, under authority of Section 404(b) of the Clean Water Act and the applicant will obtain a water quality certificate or waiver from the appropriate state agency in accordance with Section 401 of the Clean Water Act prior to a permit decision.

Pursuant to section 307(c) of the Coastal Zone Management Act of 1972 as amended (16 U.S.C. 1456(c)), for activities under consideration that are located within the coastal zone of a state which has a federally approved coastal zone management program, the applicant has certified in the permit application that the activity complies with, and will be conducted in a manner that is consistent with, the approved state coastal zone management program. By this public notice, we are requesting the state's concurrence with, objection to, or waiver of the applicant's certification. No permit decision will be made until one of these actions occur. For activities within the coastal zone of New York State, the applicant's certification and accompanying information is available from the New Jersey Department of Environmental Protection, Bure of Coastal Project Review, Room 702, L & I Building, CN 401, New Jersey 08625, Telephone Number (609) 292-2121. Comments regarding the applicant' certification should be so addressed.

In addition to any required water quality certificate and coastal zone management program concurrence, the applicant has obtained or requested the following governmental authorization for the activity under consideration:

Permit from the New Jersey State Department of Environmental Protection Energy

Any comments on the applicant's certification should be addressed to this state office.

If you have any questions concerning this application, you may contact this office at (212) 264-0184 and ask for Mr. Mark Roth.

FOR THE DISTRICT ENGINEER:

Joseph J. Seebode
Chief, Regulatory Branch

Enclosures

CENAN-OP-RW
APPLICATION NUMBER: 91-1028-OD
PUBLIC NOTICE NUMBER: 14515-91-1028-OD

DESCRIPTION OF WORK

The applicant, the Port Authority of NY and NJ, proposes to maintenance dredge Reaches B, C, and D of Port Elizabeth/Port Newark in Newark Bay in the Cities of Elizabeth and Newark, Essex and Union Counties, New Jersey. The applicant proposes to dredge by clamshell bucket, with barge overflow, a total of approximately 200,000 cubic yards of material from the three Reaches, respectively, to a maximum depth of 40 feet below the plane of mean low water with two feet of allowable overdredge as shown on the attached drawings. Approximately 60,000 cubic yards will be dredged from Reach B, 90,000 cubic yards from Reach C, and 50,000 cubic yards from Reach D.

The proposal includes ocean disposal of all 200,000 cubic yards of dredged material.

The purpose of the project is to permit the continued use of several piers in the Port Elizabeth/Port Newark facility. The permit for the proposed work, if issued, will authorize, on an initial basis only, the dredging as specified in this notice. Any subsequent maintenance dredging during the life of the permit will require that the dredged material comply with the appropriate criteria in effect at that time, and will be dependent upon the availability of an approved disposal site. Consideration is being given to issuance of a three year permit for the dredging with review of compliance with the criteria in effect prior to each disposal.

The dredged material would be transported by dump scows and deposited by bottom dumping process at the Mud Dump Site as designated by the U.S. Environmental Protection Agency (USEPA), as shown on the attached maps. The Mud Dump Site has an area of 2 square miles and an average depth of 72 feet, having its corner points located at:

LATITUDE			LONGITUDE		
40°	23'	48" North	73°	51'	28" West
40°	21'	48" North	73°	50'	00" West
40°	21'	48" North	73°	51'	28" West
40°	23'	48" North	73°	50'	00" West

This site has been used for disposal of dredged material since 1914 and has disposal depths within the site ranging from 50 to 100 feet below mean low water. The U.S. Coast Guard conducts surveillance of ocean dumping at the Mud Dump Site.

It is estimated that since 1976 approximately 7.0 million cubic yards of material have been dumped annually at the present disposal site. The disposal of dredged material has created a mound of sediment at the site which, between 1936 and 1986, has resulted in an accumulation of about 44 feet of material.

The applicant has demonstrated the need for the proposed ocean dumping based on the availability of practicable alternative methods of disposal. As stated in the Criteria (40 CFR 227.16(b)) "...alternative methods of disposal are practicable when they are available at reasonable incremental cost and energy expenditures which need not be competitive with the costs of ocean dumping, taking into account the environmental impacts associated with the use of alternatives to ocean dumping...." The New York District has evaluated the practicability of potential disposal alternatives in a report entitled "Dredged Material Disposal Within the New York District." The alternatives considered include land disposal, use as sanitary landfill cover, disposal in subaqueous borrow pits (and possible capping with clean material), creation of islands and/or wetlands, disposal on beaches or wetlands, transport and placement in deep mines, and incineration. Of these, only land disposal is considered a potentially viable alternative at the present time for the particular material proposed for disposal.

The applicant has evaluated methods of upland disposal of the dredged material as an alternative to ocean disposal stating that there is no vacant land in the vicinity of the project area upon which the dredged material could be disposed of or dewatered. Therefore, it would become necessary to transport this material by truck in a semi-fluid state to some available inland disposal site. If such a site could be found, the applicant has determined that the logistics of dealing with their associated constraints (i.e., drying of material, trucking dumping fees, upland disposal approvals, etc.) would increase the projected cost of the project beyond the point that would make the project economically feasible.

TESTING-GENERAL COMMENTS

EPA Region II under the authority of 40 CFR Section 225.2(b) has requested that liquid phase chemical analysis be performed for mercury, cadmium, PCBs, DDT and petroleum hydrocarbons. The results of this analysis are shown in Table 1 for each Reach.

Bioassay Results: In accordance with EPA's Ocean Dumping Regulations, published in the Register on 11 January 1977, suspended particulate phase and solid phase bioassays are required for the proposed dredged material utilizing the test species as discussed below. The results of these tests are presented in Table 2 for each Reach.

The suspended particulate phase is considered to be the supernatant remaining after one hour of undisturbed settling of the mixture resulting from a vigorous 30 minute agitation of one part bottom sediment from the dredging site with four parts water collected from the dredging site or the disposal site, as appropriate for the type of dredging operation. The solid phase is considered to be all material settling to the bottom within one hour. For this permit application, natural seawater was substituted for disposal site water in the solid phase bioassay. This substitution conforms with the procedures in the Implementation Manual for the Ecological Evaluation of Proposed Discharge of Dredged Material Into Ocean Waters.

For the suspended particulate phase bioassay, lethal concentrations (LC50s), those concentrations of suspended particulate phase resulting in 50% mortality, were determined for the animal species Acartia tonsa, Mysidopsis bahia and Menidia beryllina.

Based on these values, the LPC (Limiting Permissible Concentration) values are determined by applying a safety factor of 100 (0.01 times the critical EC50 or LC50). The material can be considered for disposal only if the concentration of the disposal water in both liquid and suspended particulate phases is diluted to below that of the LPC after 4 hours of initial mixing.

The dilution of the proposed dredged material after disposal at the Mud Dump Site has been evaluated by use of the Tetra Tech computer model. A description of the model has been published as Technical Report D-78-47 of the Corps' Dredged Material Research Program, and is entitled Evaluation and Calibration of the Tetra Tech Dredged Material Disposal Models Based on Field Data. The New York District requested that a study be conducted which would give example dilutions resulting from typical disposal operations and dredged materials found in the New York District. This study has been completed and is entitled Discussion of Dredged Material Disposal Models and Their Application for the New York District.

For the solid phase bioassay, the results are evaluated for biological and statistically significant differences in mortality between test organisms subjected to both proposed dredged sediment and a reference sediment. The reference sediment represents existing background conditions in the vicinity of the dumpsite, but away from the influence of any disposal operation. The Implementation Manual for the Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters, published by USEPA and the Corps of Engineers in July 1977, specifies that differences in survival of the test organisms in the reference and test treatments be evaluated either individually by species or on a pooled community basis. In addition, the Manual has defined the LPC for the solid phase to be exceeded when the difference in mortality between animals in the reference and test sediments is statistically significant and greater than 10 percent.

Body burden analyses of the solid phase organisms surviving the 10 day test to estimate bioaccumulation potential were made for mercury, cadmium, PCBs, DDT and petroleum hydrocarbons. Mean levels for each constituent occurring in the test animals exposed to the proposed dredged material and to the reference sediment are shown in Table 3 for each Reach seen below (reference values are in parentheses). Detection limits are shown for each of the chemical constituents analyzed.

The data listed for the analysis of petroleum hydrocarbons include petroleum compounds plus natural body lipids within the organism. As a result, the values indicated for the test are environmentally conservative.

Due to the discrete nature of the dredging areas proposed by the applicant, sediment analysis and test data, except for the dioxin results, are reported below by individual Reach.

REACH B

Based upon analyses of 3 sediment samples submitted by the applicant, the character of the dredged material is as follows: 2.7% sand, 61.3% silt and 36.0% clay.

TABLE 1-REACH B

Liquid Phase Chemical Analysis Results (ppb)

CONSTITUENTS	D.L.	ELUTRIATE	SITE WATER
Mercury	(0.2)	N.D.	N.D.
Cadmium	(0.1)	0.457	0.076
PCB	(0.1)	N.D.	N.D.
Petroleum hydrocarbons	(50.0)	N.D.	N.D.
DDT	(0.05)	N.D.	N.D.

D.L. - Detection Limits
N.D. - Not Detected at the Detection Limit

There is a statistically significant difference in the cadmium concentration in the elutriate compared to the site water; however this will dilute to environmentally acceptable levels within a reasonable period of time.

As seen in Table 2 for Reach B (seen on the following page, page 8), the suspended particulate phase, Acartia tonsa, was the most sensitive of the three species examined. The LC50 was determined to be 76.0% of the 100% suspended particulate phase after 96 hours. The resulting LPC was therefore determined to be 0.76%. Using the constraints in this study most closely approximating those of the disposal operation for this proposed dredged material, the dilution after four hours would be 0.0043%. The dilution after four hours of 0.0043% is below the LPC of 0.76% for the suspended particulate phases, respectively. Therefore, no constraints on the point disposal or non-point disposal of the dredged material appears warranted.

TABLE 3-REACH B

Body Burden Levels (ppm) in Test Species

Constituents	(D.L.)	Palaemonetes pugio	Nereis virens	Mercenaria mercenaria
Mercury	(0.20)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)
Cadmium	(0.25)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)
PCB	(0.04)	0.046(N.D.)	0.156(0.045)	0.06(N.D.)
Petroleum hydrocarbons	(0.10)	39.72(5.19)	20.66(8.29)	20.94(11.22)
DDT	(0.02)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)

D.L. - Detection Limits
N.D. - Not detected at the Detection Limit

TABLE NUMBER 2-REACH B: BIOASSAY RESULTS

APPLICATION NUMBER: 91-1028-OD

Suspended particulate phase (96 Hour Test)

	50 (critical)	LPC after 4 hours	Dilution after 4 hours
Acartia tonsa	76.0%	0.76%	0.0043
Mysidopsis bahia	>100%	1.00%	0.0043
Menidia beryllina	>100%	1.00%	0.0043

Solid Phase (10 days)

	% Survival in reference	% Survival in test	Difference (Reference-Test)	Is difference statistically significant? (p-0.05)
Palaemonetes pugio	93.8	87.0	6.8	NO
Mercenaria mercenaria	100.0	100.0	0.0	NO
Nereis virens	92.0	78.0	14.0	NO
TOTAL COMMUNITY	95.3	88.7	6.5	YES

LC 50-Lethal Concentration resulting in 50% mortality
LPC-Limiting Permissible Concentration (0.01 times the critical LC 50)

Bioassay test results for Nereis virens indicate a greater than 10% difference in survival between test and reference organisms; however, this difference is not statistically significant. Total community mortality was statistically significant higher in test organisms, but the difference was less than 10%. Bioaccumulation test results for petroleum hydrocarbons indicate a statistically significant bioaccumulation in the worm Nereis virens. There is presently no matrix guideline for this class of chemical constituents. Bioaccumulation testing results for PCBs indicate a statistically significant bioaccumulation in both Paleomonetes pugio and Mercenaria mercenaria. Levels in both organisms were below matrix values.

REACH C

Based upon analyses of 8 sediment samples submitted by the applicant, the character of the dredged material is as follows: 6.9% sand, 56.0% silt and 37.1% clay.

TABLE 1-REACH C

Liquid Phase Chemical Analysis Results (ppb)

CONSTITUENTS	D.L.	ELUTRIATE	SITE WATER
Mercury	(0.2)	N.D.	N.D.
Cadmium	(0.1)	0.413	N.D.
PCB	(0.1)	N.D.	N.D.
Petroleum hydrocarbons	(50.0)	N.D.	N.D.
DDT	(0.05)	N.D.	N.D.

D.L. - Detection Limits
N.D. - Not Detected at the Detection Limit

There is a statistically significant difference in the cadmium concentration in the elutriate compared to the site water, which will dilute to environmentally acceptable levels within a reasonable time.

As seen in Table 2 for Reach C, the suspended particulate phase, Acartia tonsa, was the most sensitive of the three species examined. The LC50 was determined to be 100.0% of the 100% suspended particulate phase after 96 hours. The resulting LPC was therefore determined to be 1.00%. Using the constraints in this study most closely approximating those of the disposal operation for this proposed dredged material, the dilution after four hours would be 0.0043%. The dilution after four hours of 0.0043% is below the LPC of 1.00% for the suspended particulate phases, respectively. Therefore, no constraints on the point disposal or non-point disposal of the dredged material appears warranted.

TABLE NUMBER 2-REACH C: BIOASSAY RESULTS

APPLICATION NUMBER: 91-1028-OD

Suspended particulate phase (96 Hour Test)

	50 (critical)	LPC after 4 hours	Dilution after 4 hours
Acartia tonsa	>100%	1.00%	0.0043
Mysidopsis bahia	>100%	1.00%	0.0043
Menidia beryllina	>100%	1.00%	0.0043

Solid Phase (10 days)

	% Survival in reference	% Survival in test	Difference (Reference-Test)	Is difference statistically significant? (p-0.05)
Palaemonetes pugio	93.8	88.2	5.6	NO
Mercenaria mercenaria	100.0	100.0	0.0	NO
Nereis virens	92.0	78.0	14.0	NO
TOTAL COMMUNITY	95.3	88.7	6.5	NO

LC 50-Lethal Concentration resulting in 50% mortality
LPC-Limiting Permissible Concentration (0.01 times the critical LC 50)

TABLE 3-REACH C

Body Burden Levels (ppm) in Test Species

Constituents	(D.L.)	Palaemonetes pugio	Nereis virens	Mercenaria mercenaria
Mercury	(0.20)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)
Cadmium	(0.25)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)
PCB	(0.04)	N.D.(N.D.)	0.09(0.05)	N.D.(N.D.)
Petroleum hydrocarbons	(0.10)	9.03(5.19)	17.01(8.29)	18.14(11.22)
DDT	(0.02)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)

D.L. - Detection Limits
N.D. - Not detected at the Detection Limit

Bioassay results for Nereis virens indicate a greater than 10% difference in survival between test and reference organisms; however, this difference is not statistically significant.

REACH D

Based upon analyses of 5 sediment samples submitted by the applicant, the character of the dredged material is as follows: 9.2% sand, 57.8% silt and 32.0% clay.

TABLE 1-REACH D

Liquid Phase Chemical Analysis Results (ppb)

CONSTITUENTS	D.L.	ELUTRIATE	SITE WATER
Mercury	(0.2)	N.D.	N.D.
Cadmium	(0.1)	0.63	0.1
PCB	(0.1)	N.D.	N.D.
Petroleum hydrocarbons	(50.0)	N.D.	N.D.
DDT	(0.05)	N.D.	N.D.

D.L. - Detection Limits
N.D. - Not Detected at the Detection Limit

There is a statistically significant difference in the cadmium concentration in the elutriate compared to the site water, which will dilute to environmentally acceptable levels within a reasonable amount of time.

As seen in Table 2 for Reach D, the suspended particulate phase, Acartia tonsa, was the most sensitive of the three species examined. The LC50 was determined to be 100.0% of the 100% suspended particulate phase after 96 hours. The resulting LPC was therefore determined to be 1.00%. Using the constraints in this study most closely approximating those of the disposal operation for this proposed dredged material, the dilution after four hours would be 0.0043%. The dilution after four hours of 0.0043% is below the LPC of 1.00% for the suspended particulate phases, respectively. Therefore, no constraints on the point disposal or non-point disposal of the dredged material appears warranted.

TABLE NUMBER 2-REACH D: BIOASSAY RESULTS APPLICATION NUMBER: 91-1028-OD

Suspended particulate phase (96 Hour Test)

	LC 50 (critical)	LPC after 4 hours	Dilution after 4 hours
Acartia tonsa	>100%	1.00%	0.0043
Mysidopsis bahia	>100%	1.00%	0.0043
Menidia beryllina	>100%	1.00%	0.0043

Solid Phase (10 days)

	% Survival reference	% Survival in test	Difference (Reference-Test)	Is difference statistically in significant? (p-0.05)
Palaemonetes pugio	93.8	92.6	1.2	NO
Mercenaria mercenaria	100.0	99.0	1.0	NO
Nereis virens	92.0	90.0	2.0	NO
TOTAL COMMUNITY	95.3	93.9	1.4	NO

LC 50-Lethal Concentration resulting in 50% mortality
LPC-Limiting Permissible Concentration (0.01 times the critical LC 50)

TABLE 3-REACH D

Body Burden Levels (ppm) in Test Species

Constituents	(D.L.)	Palaemonetes pugio	Nereis virens	Mercenaria mercenaria
Mercury	(0.20)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)
Cadmium	(0.25)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)
PCB	(0.04)	N.D.(N.D.)	0.054(0.046)	N.D.(N.D.)
Petroleum hydrocarbons	(0.10)	45.4(5.19)	14.57(8.29)	11.35(11.22)
DDT	(0.02)	N.D.(N.D.)	N.D.(N.D.)	N.D.(N.D.)

D.L. - Detection Limits
N.D. - Not detected at the Detection Limit

There is a statistically significant bioaccumulation of petroleum hydrocarbons in the grass shrimp Paleomonetes pugio. There is currently no matrix guideline values for this chemical compound class.

DIOXIN TESTING RESULTS
(See Table 4)

In the sediments of all the Reaches, dioxin levels in the 28 day bioassay/bioaccumulation testing were significantly different in test organisms when compared to reference organisms.

SUMMARY

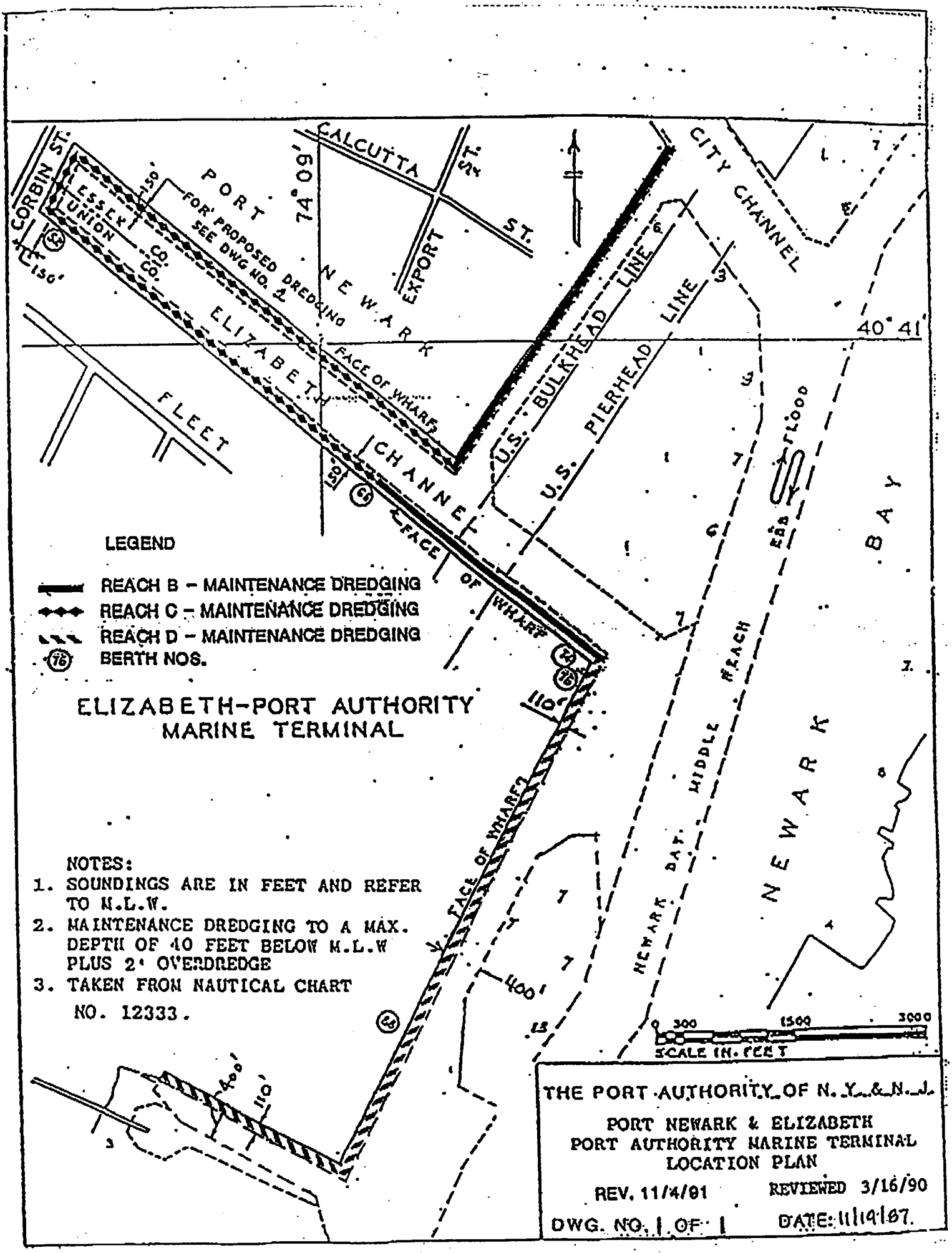
The environmental significance of bioaccumulation of petroleum hydrocarbons is, at present, undetermined. Levels of PCB bioaccumulation were below the Interpretive Guidance Levels (i. e., the "matrix") for the Mud Dump Site, and therefore, are not considered to be an environmental risk.

The environmental significance of bioaccumulation of dioxin is not yet understood. The interagency dioxin steering committee has agreed that ocean disposal of sediments producing dioxin bioaccumulation of greater than 4 parts per trillion would require de facto capping at the Mud Dump Site. Results of the bioassay/bioaccumulation testing indicate that the proposed dredged material does meet the current ocean disposal interim guidelines for dioxin, and can, therefore, be disposed of at the Mud Dump Site, with de facto capping.

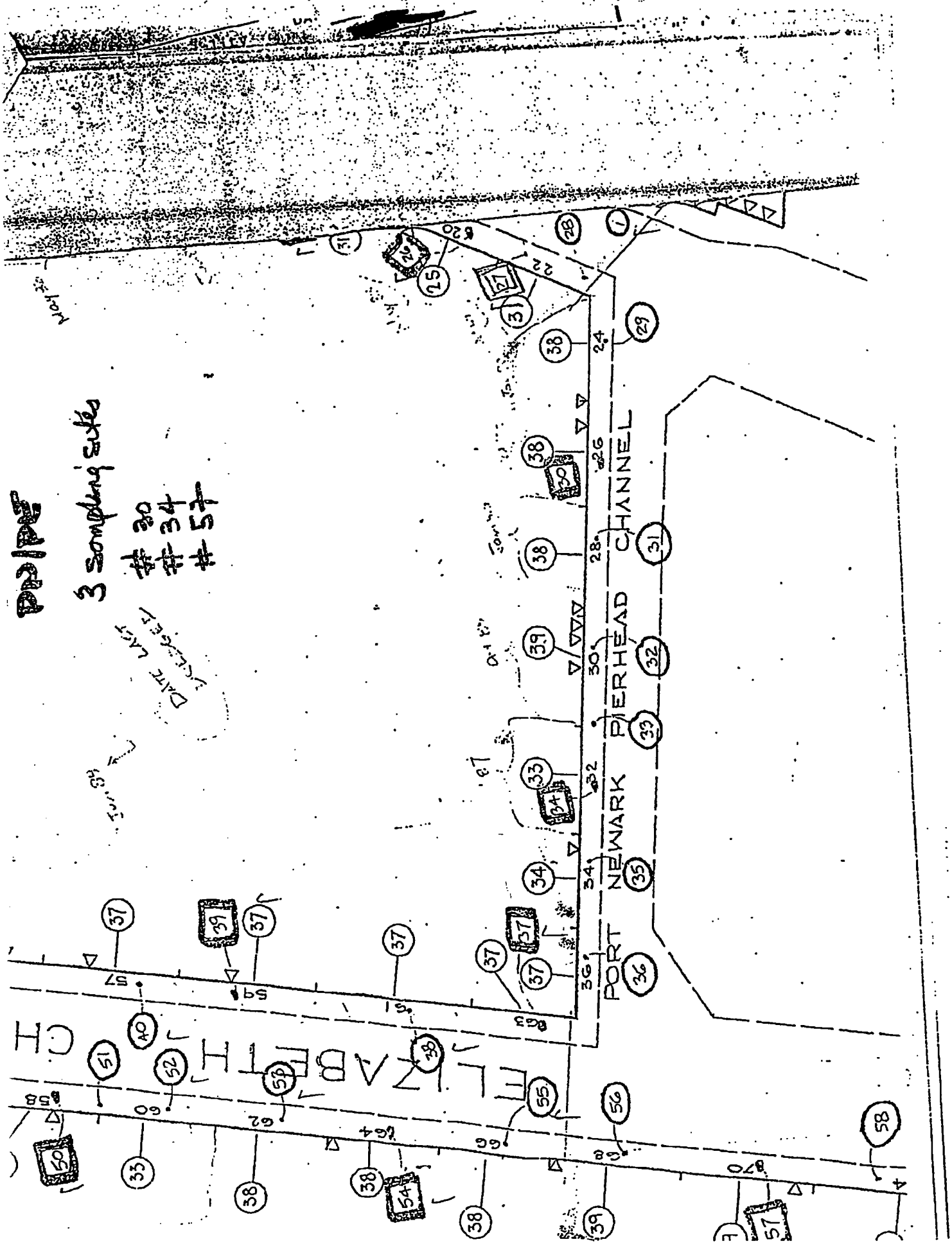
TABLE NUMBER 4: 28 DAY DIOXIN RESULTS APPLICATION NUMBER: 91-1028-OD

	BIOACCUMULATION RESULTS (pptr)*			
	Reference	Test	Difference (Reference-Test)	Is difference statistically significant? (p-0.05)
Nereis virens				
Reach B	<1.00	9.74	8.74	YES
Reach C	<1.00	10.54	9.74	YES
Reach D	<1.00	4.96	3.96	YES

*Concentration in parts per trillion (pptr)


CORBIN ST.
ESSEX UNION CO.
150'
PORT NEWARK
FOR PROPOSED DREDGING SEE DWG NO. 2
CALCUTTA ST.
EXPORT ST.
740'
CITY CHANNEL
U.S. BULKHEAD LINE
U.S. PIERHEAD LINE
40° 41'
ELIZABETH
FACE OF WHARF
FLEET
CHANNEL
FACE OF WHARF
FLOOD
EBB
NEWARK BAY
MIDDLE REACH
NEWARK BAY, NEWARK
FACE OF WHARF
110'
400'
LEGEND
REACH B – MAINTENANCE DREDGING
REACH C – MAINTENANCE DREDGING
REACH D – MAINTENANCE DREDGING
BERTH NOS.
ELIZABETH-PORT AUTHORITY MARINE TERMINAL
NOTES:
1. SOUNDINGS ARE IN FEET AND REFER TO M.L.W.
2. MAINTENANCE DREDGING TO A MAX. DEPTH OF 40 FEET BELOW M.L.W PLUS 2' OVERDREDGE
3. TAKEN FROM NAUTICAL CHART NO. 12333.
0 300 1500 3000
SCALE IN FEET
THE PORT AUTHORITY OF N.Y. & N.J.
PORT NEWARK & ELIZABETH PORT AUTHORITY MARINE TERMINAL LOCATION PLAN
REV. 11/4/91
REVIEWED 3/16/90
DWG. NO. 1 OF 1
DATE: 11/19/87

ACOE SAMPLING LOCATIONS



BERTH No.	DATE SOUNDED
98	10-3-89

BERTH No.	DATE SOUNDED
56	4-24-89
58	9-11-89
60	9-11-89
62	2-1-90
64	2-6-90
66	2-6-90
68	2-3-90
70	2-3-90
72	2-3-90
74	2-3-90
76	6-20-89
78	8-22-89
80	10-10-89
82	6-17-89
86	6-23-89
88	6-19-89
90	1-31-90
92	1-31-90
94	10-3-89
96	10-3-89

Reach C
PIPE

n=8

Sde #37
39
41
43
45 Top/Bottom
47
50
54

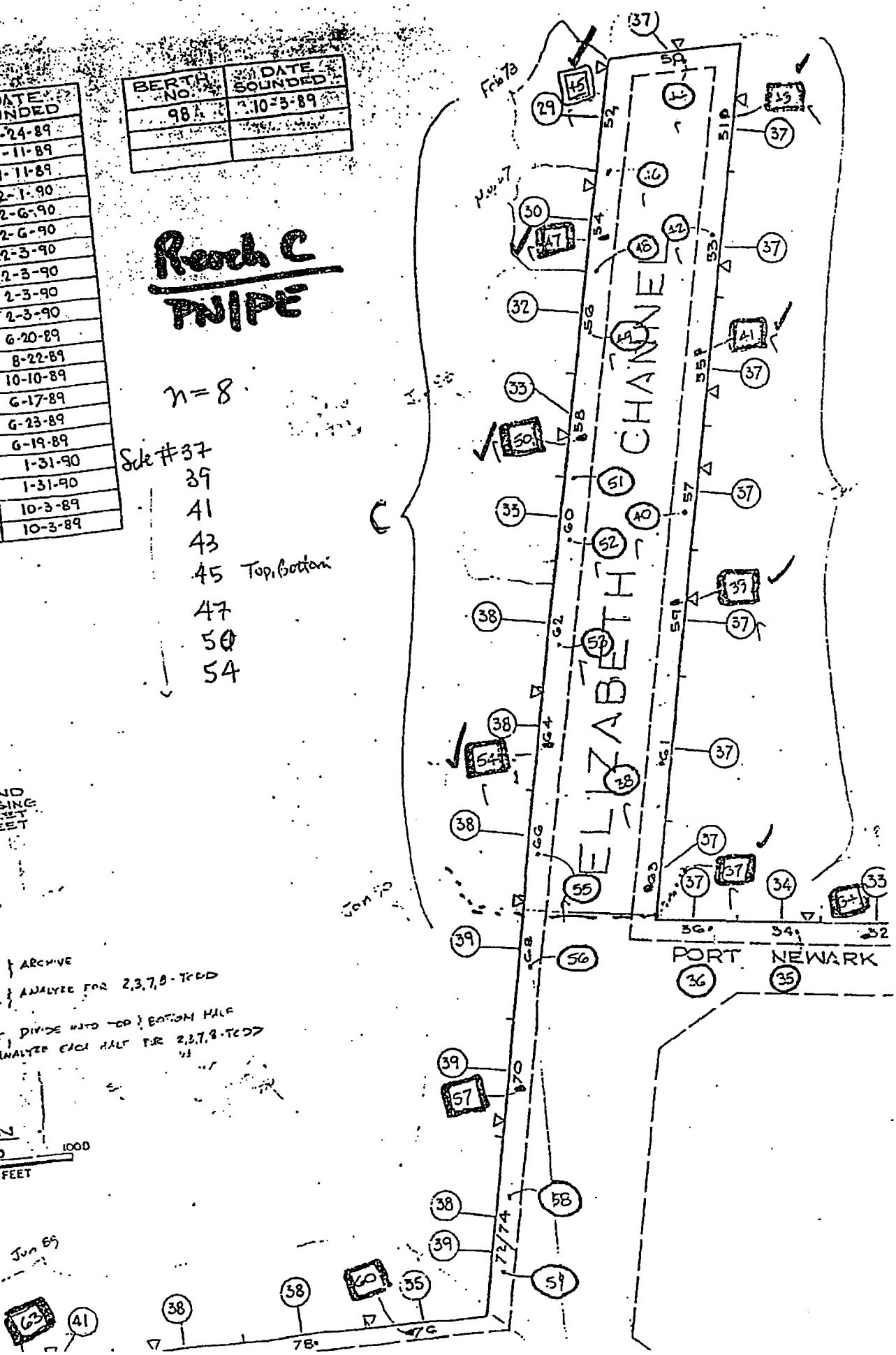
OUTFALL

IN FEET AND
W/DREDGING
T OF 40 FEET
PLUS 2 FEET

TYS SPRING

SAMPLE } ARCHIVE
SAMPLE } ANALYZE FOR 2,3,7,8-TCDD
SAMPLE, DIVIDE INTO TOP } BOTTOM HALF
} ANALYZE EACH HALF FOR 2,3,7,8-TCDD

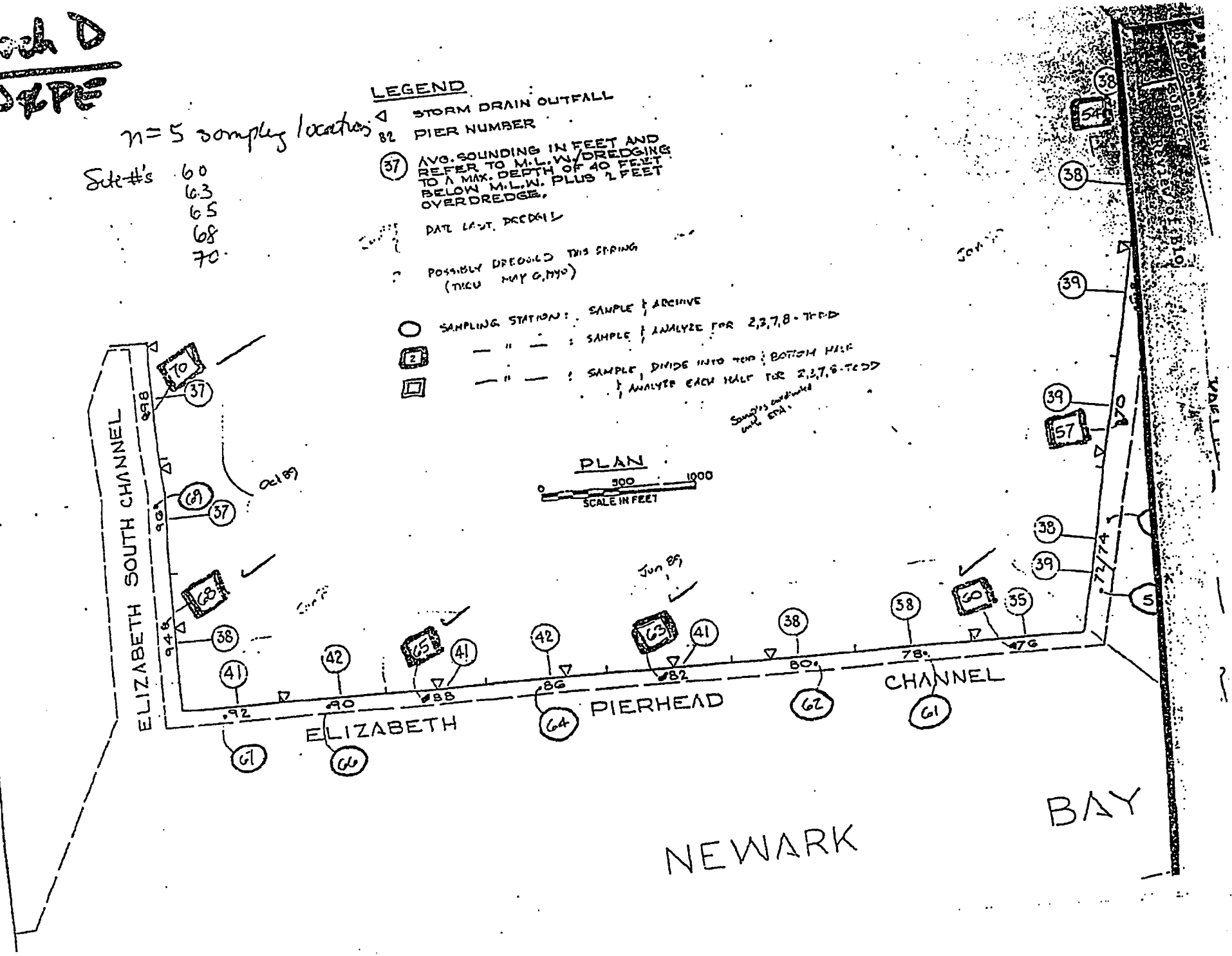
PLAN
500 1000
SCALE IN FEET



each D
NEPE

n = 5 sampling locations

Site #'s 60
63
65
68
70


LEGEND
STORM DRAIN OUTFALL
82 PIER NUMBER
(37) AVG. SOUNDING IN FEET AND REFER TO M.L.W. DREDGING TO A MAX. DEPTH OF 40 FEET BELOW M.L.W. PLUS 2 FEET OVERDREDGE.
DATE LAST DREDGED
? POSSIBLY DREDGED THIS SPRING (TRCU MAY 6, 1990)
SAMPLING STATION: SAMPLE & ARCHIVE
— " — : SAMPLE & ANALYZE FOR 2,3,7,8-TCDD
— " — : SAMPLE, DIVIDE INTO TOP & BOTTOM HALF & ANALYZE EACH HALF FOR 2,3,7,8-TCDD
Samples archived until EPA
PLAN
0 500 1000
SCALE IN FEET
ELIZABETH SOUTH CHANNEL
ELIZABETH PIERHEAD CHANNEL
NEWARK BAY
998
948
92
90
88
86
82
80
78
76
Oct 89
Jun 89
Jun 89
Jun

THE PORT AUTHORITY OF NY & NJ

One World Trade Center
New York, N.Y. 10048

(212) 435-7000
(201) 961-6600

HAND DELIVERY

September 25, 1991

Mr. Joseph Seebode
Chief, Regulatory Branch
Department of the Army
Corps of Engineers
New York District
Jacob K. Javits Federal Building
New York, New York 10278-0090

SUBJECT: PORT NEWARK AND THE ELIZABETH PORT AUTHORITY MARINE TERMINAL - MAINTENANCE DREDGING

REFERENCE: Transmittal: R. Monti to J. Seebode dated 4/11/90.

Dear Mr. Seebode:

The Port Authority of New York and New Jersey hereby requests that our application to perform maintenance dredging at Port Newark and the Elizabeth Port Authority Marine Terminal be modified to delete Reach A (Newark Channel). As discussed with staff of the N.Y. District's Water Quality Compliance Section, Reach A must undergo further testing to ascertain whether all or a portion of this material can be disposed at the ocean disposal site.

Since there is a pressing need to obtain, as soon as possible, authorization to perform maintenance dredging in Reaches B, C, and D, and it appears likely that further testing and reporting for Reach A will require at least an additional three months, the more prudent approach is to consider Reach A separately. Reaches B, C, and D are independent of Reach A and, therefore, can be maintenance dredged absent concurrent dredging in Reach A. Accordingly, it is hereby requested that you provide your concurrence in this approach.

Pending guidance from the Water Quality Compliance Branch, in the near future the Port Authority will be submitting additional information on Reach A so that we can continue to maintain all berths at the Port Newark/Elizabeth Facility.

Thank you for your continued cooperation.

Very truly yours,

Christopher Zeppie
Supervisor, Permits &
Governmental Approvals

cc: Monte Greges, NY District Corps.; Water Quality Compliance

Writer's direct dial telephone _____

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
CENANOP-W	Review of Bioassay Data: PA of NY&NJ PORT NEWARK/PORT ELIZABETH Reach A

TO MEMO FOR THE RECORD

FROM C, Water Quality Compliance Branch

DATE MARCH 1991

CMT 1 Joe OLHA X5621

1. Enclosed is an interpretive summary of results of three-phased bioassays performed on dredged material composited from 15 sampling sites (shown on inclosed map) located In Newark Bay @ PN/PE - Reach A. . Bioassays were run in accordance with "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters", which is the Implementation Manual for Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972. At the time that samples were collected, the 21 Dec 84 edition of the NYD/EPA Region 2 Guidance Manual was in effect.

2. Bioassays were performed by ENSECO; Marblehead, Mass and Combridge, Mass. Samples were collected on *see below and test results were ~~completed~~ reported on December 1990, having been completed during July 1990.

3. All samples consisted of cores to project depth. According to the testing laboratory's report, stratification was NOT observed in sample cores. Grain size analyses indicate the proposed material to average: 4.23% sand
60.83% silt
34.94% clay

4. Analysis of the results for the three phases indicates that the LPC for this material is within acceptable limits as defined in the EPA Ocean Dumping Regulations and the Corps/EPA Implementation Manual.

5. Results of bioaccumulation analyses performed on organisms surviving the solid phase testing are also inclosed. An evaluation of these data indicates that the proposed dredged material does not exhibit an environmentally significant bioaccumulation potential.

Incl
as

MONTE P. GREGES
Chief, Water Quality Compliance Branch

SAMPLE COLLECTION

* Test Samples 5/14-5/31, 1990 by PA of NY&NJ
Reference " 5/16, 1990 by Aqua Survey, Inc
Control " 5/22, 1990 by Aqua Survey, Inc.

JO 3/28/91

Sheet C

PN/PS Reach A

Total surface area of ~~channel.~~ Reach A $\frac{(685' \times 4200') + (685' \times 2500')}{2.877 \times 10^6 + 1.713 \times 10^6}$

t	% dilution	area affected	% of total area
1s	$\frac{8.10\ cf}{4067\ cf} = .20\%$	96.83 sq ft	$\frac{96.83}{4,600,000} = .0027\%$

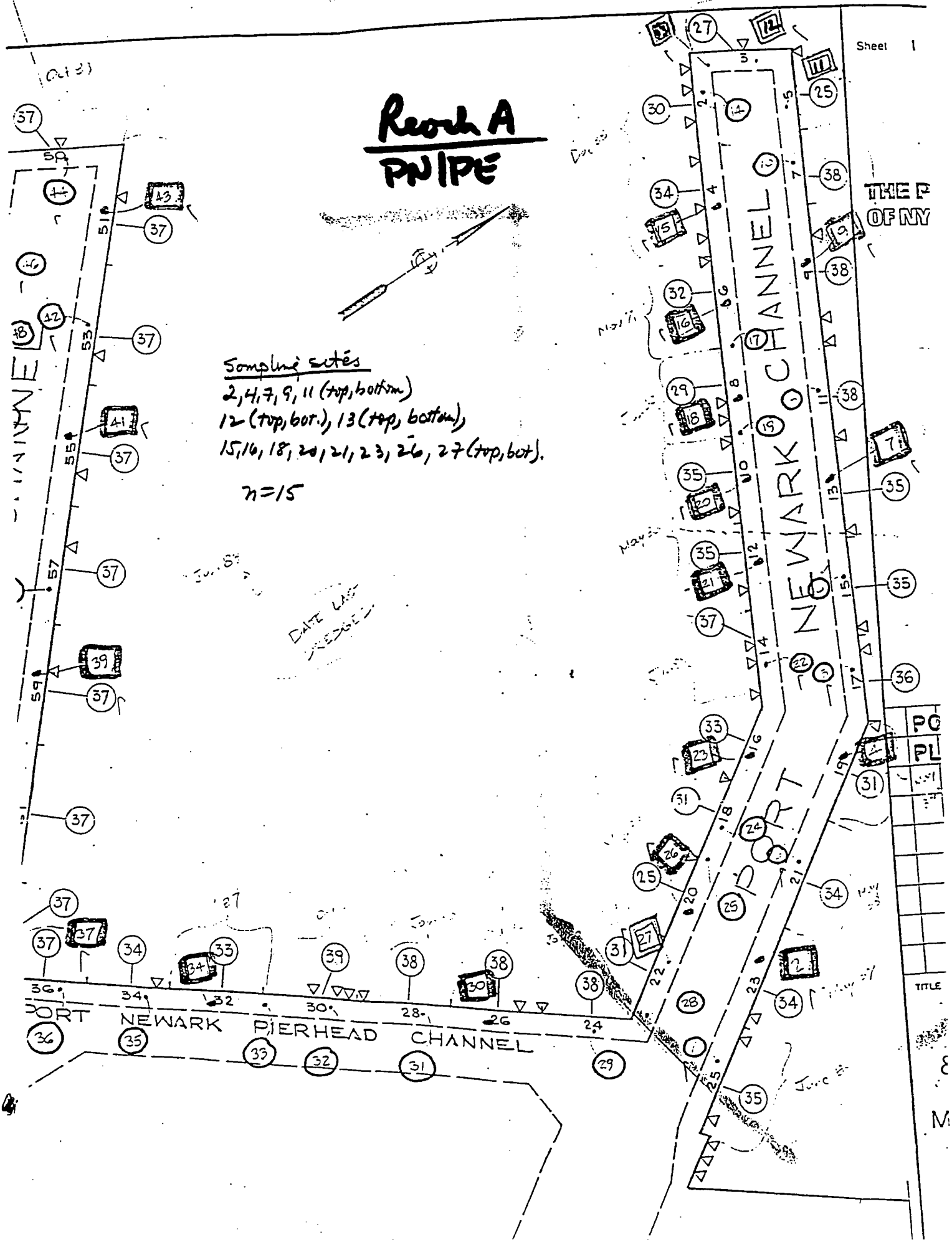
t	L	x	A	V
1	160.22	0.59	96.83	150 cy
0	164.32	5.9	950.33	1525 cy
30	205.18	59	11,009	17,125 cy

*overflow has ceased

Based on the elutriate/bioassay testing done, this material will dilute to acceptable levels in < 1 second affecting 96.83 sq ft or << 1 % of the total area of the channel.

JD 7/2/91

Comments: In less than 1s, the % dilution of overflow will already be less than lower LPC for suspended particulate phase.


Reach A
PIPE
Sampling cuts
2, 4, 7, 9, 11 (top, bottom)
12 (top, bot.), 13 (top, bottom),
15, 16, 18, 20, 21, 23, 26, 27 (top, bot).
n=15
NEWARK CHANNEL
PORT NEWARK PIERHEAD CHANNEL
Sheet 1

Applicant: Port Arthur NTB NJ
PN/PE - Reach A

Table 1. BIOASSAY RESULTS

	LC_{50} or EC_{50} (critical)	LPC after 4 hours	DILUTION after 4 hours
LIQUID PHASE (96-hour test)			
Skeletomena costatum			
Mysidopsis bahia			
Menidia ~~menidia~~ beryllina			
SUSPENDED PHASE (96-hour test)			
Acartia tonsa	>100%	>1%	.0043%
Mysidopsis bahia	>100%	>1%	.0043%
Menidia ~~menidia~~ beryllina	>100%	>1%	.0043%

LC_{50} - Lethal Concentration resulting in 50% mortality
EC_{50} - Effective Concentration resulting in 50% inhibition (applies to phytoplankton)
LPC - Limiting Permissible Concentration (0.01 times critical EC_{50} or LC_{50})

where $F = t^2$

	% SURVIVAL			COMPARISON OF REFERENCE & TEST SEDIMENT							
	Control $\bar{X}$ S	Reference $\bar{X}_R$ S_R	Test $\bar{X}_T$ S_T	$\bar{d} = \lvert\bar{X}_R - \bar{X}_T\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2 + S_T^2}{n}}$	calculated $F = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	K	$\nu = K(n-1)$	Table F	Is diff. Statistically significant *
SOLID PHASE (10-day test)											
Paleomonetes	94.0 (2.65)	93.8 (4.32)	70.4 (11.17)	23.4	5.36	19.06	5	2	8	5.32	YES
Mercenaria mercenaria	100.0 (0.00)	100.0 (0.00)	99.0 (2.24)	1.0	1.00	1.0	5	2	8	5.32	NO
Nereis virens	98.33 (2.89)	92.0 (5.70)	92.0 (6.71)	0.0	3.94	0.0	5	2	8	5.32	NO
Total Community	97.44 (3.32)	95.27 (5.22)	87.13 (14.45)	8.14	6.87	1.40	15	2	28	4.19	NO

organisms/species/replicates

replicates 3 CONTROL
5 Ref, Test

Total # organisms/test

* - significant at 95% confidence level
SD_c - standard deviation of control
SD_t - standard deviation of test sediment
SD_d - standard deviation of difference between means
D.F. - degrees of freedom
SD_R - standard deviation of reference sediment

Table 1. BIOASSAY RESULTS / 28-day / 2,3,7,8-Dioxin Bioassay / Bioaccumul. Applicant: Reaches A-D Port Newark / Port Elizabeth

SOLID PHASE (10-day test)

NEREIS VIRENS

	% SURVIVAL			COMPARISON OF REFERENCE & TEST SEDIMENT								
	Control $\bar{X}$ S	Reference $\bar{X}_R$ S_R	Test $\bar{X}_T$ S_T	$\bar{d} = \lvert\bar{X}_R - \bar{X}_T\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2 + S_T^2}{n}}$	calculated $F = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	k	$\nu = k(n-1)$	Table F	Is diff Statist significant*
	91.67 (2.89)	68.00 (6.71)									
REACH A			83.00 (11.51)	TEST > REF IN ALL CASES.							I
REACH B			69.00 (17.46)								
REACH C			77.00 (13.04)								
REACH D			83.00 (9.75)								

NEREIS VIRENS

concentration in tissue (ppb)

	Control $\bar{X}$ S	Reference $\bar{X}_R$ S_R	Test $\bar{X}_T$ S_T	$\bar{d} = \lvert\bar{X}_R - \bar{X}_T\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2 + S_T^2}{n}}$	calculated $F = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	k	$\nu = k(n-1)$	Table F	Is diff Statist significant*
Reach A		<1.00 (0)	18.00 (4.06)	17.00	1.82	87.7	5	2	8	[illegible]	YES
B		<1.00 (0)	9.74 (3.56)	8.74	1.59	30.1	5	2	8		YES
C		<1.00 (0)	10.54 (0.95)	9.54	0.42	504.2	5	2	8		YES
Reach D		<1.00 (0)	4.96 (0.33)	3.96	0.15	720.0	5	2	8		YES

organisms/species/replicates

replicates

Total # organisms/test

* - significant at 95% confidence level

SD_c - standard deviation of control

SD_t - standard deviation of test sediment

SD_d - standard deviation of difference between means

D.F. - degrees of freedom

SD_r - standard deviation of reference sediment

Table 3. SUSPENDED PA..T..LATE PHASE BIOASSAY RESULTS (..0 .. test)

Applicant: Port Authority of NY & NJ
PNPE ~ Reach A

Acartia tonsa
(copepod)

% Survival
Test Concentrations

	Control	10%	50%	100%	LC_{50}
4 hr	100%	100%	100%	100%	$\geq$ 100%
8 hr	100%	100%	100%	100%	> 100%
24 hr	98%	98%	98%	98%	> 100%
48 hr	93%	88%	95%	85%	> 100%
72 hr	93%	88%	90%	78%	> 100%
96 hr	93%	88%	90%	70%	> 100%

(# organisms/test)

Mysidopsis bahia
(mysid shrimp)

% Survival
Test Concentrations

	Control	10%	50%	100%	LC50
4 hr	100%	100%	100%	100%	$\geq$ 100%
8 hr	100%	100%	98%	100%	> 100%
24 hr	100%	100%	98%	100%	> 100%
48 hr	100%	100%	98%	100%	> 100%
72 hr	100%	98%	98%	100%	> 100%
96 hr	98%	98%	97%	90%	> 100%

(#organisms/test)

Menidia beryllina
(fish)

% Survival
Test Concentrations

	Control	10%	50%	100%	LC50
4 hr	100%	100%	100%	100%	$\geq$ 100%
8 hr	100%	100%	100%	100%	> 100%
24 hr	100%	100%	100%	100%	> 100%
48 hr	100%	100%	100%	100%	> 100%
72 hr	100%	100%	100%	100%	> 100%
96 hr	100%	100%	98%	98%	> 100%

(#organisms/test)

LC_{50} - Lethal Concentration resulting in 50% mortality

Table 4. Dilution Evaluation Based on the Tetra Tech Model

Applicant: Port Authority of NY & NJ
PN/PE ~ Reach A

The dilution of the proposed dredged material has been evaluated by use of the Tetra Tech computer model. A description of the model has been published as Technical Report D-78-47 of the Corps' Dredged Material Research Program, and is entitled Evaluation and Calibration of the Tetra Tech Dredged Material Disposal Models Based on Field Data. The New York District requested that a study be conducted which would give example dilutions resulting from typical disposal operations and dredged materials found in the New York District. This study has been completed and is entitled Discussion of Dredged Material Disposal Models and Their Application for the New York District.

This evaluation is based on model run number 12, which most closely approximates the project disposal operations and dredged material.

Based on this model run, the dilution of the material at four hours is predicted to be .0043 %.

The model run selected most closely approximates the project material for the parameter of percent moisture content, because this parameter is the most sensitive.

Moisture content is 55.23 %.

5. BIOACCUMULATION TEST RESULTS. (10 Day Laboratory Test)

Applicant: PA of NJ & NJ - Port Elizabeth / Port Newark — Reach A

n = 5

			$\bar{x}$	S	$\bar{d} = \lvert \bar{x}_{Ref} - \bar{x}_{test} \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{Ref}^2 + S_{test}^2}{n}}$	Calculated "F" $= \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	Table "F"	Is difference statistically significant at 95% confidence level?
	Palaemonetes Pugio	Ref	5.19	3.22	28.21	4.43	40.5	5.318	YES
		Test	33.40	9.37					
ppm	Mercenaria mercenaria	Ref	11.22	7.58	29.78	4.47	44.36		YES
		Test	41.00	6.52					
	Nereis Virens	Ref	8.29	3.72	27.18	3.37	65.05		YES
		Test	35.47	6.55					
	Palaemonetes Pugio	Ref	0.02	0.00	0.025	.012	4.34		NO
		Test	0.045	0.027					
4ppm	Mercenaria mercenaria	Ref	0.02	0.00	0.023	.003	58.8		YES
		Test	0.043	0.006					
	Nereis Virens	Ref	0.045	0.012	0.096	.045	4.63		NO
		Test	0.141	0.099					
	Palaemonetes Pugio	Ref	<0.20	ø	0	—	—	—	NO
		Test	<0.20	ø					
20ppm	Mercenaria mercenaria	Ref	<0.20	ø		—	—	—	
		Test	<0.20	ø					
	Nereis Virens	Ref	<0.20	ø		—	—	—	
		Test	<0.20	ø					
d	Palaemonetes Pugio	Ref	<0.25	ø		—	—	—	
25ppm		Test	<0.25	ø					
	Mercenaria mercenaria	Ref	<0.25	ø		—	—	—	
		Test	<0.25	ø					
	Nereis Virens	Ref	<0.25	ø		—	—	—	
		Test	<0.25	ø					

tatistically Significant (95% confidence level)

[illegible] not determined since values were below detection limits.

Le 5. BIOACCUMULATION TEST RESULTS. (10 Day Laboratory Test)

Pch A / PN4PE

Applicant: _____

	n=		$\bar{x}$	S	$\bar{d} = \lvert \bar{x}_{Ref} - \bar{x}_{test} \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{Ref}^2 + S_{Test}^2}{n}}$	Calculated "F" $= \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	C.V. $= \frac{S}{\bar{x}}$ Ref. & Test (5 reps)	Sub-samples (3 reps)	% Recovery
)T	Palaemonetes	Ref	<0.02	0	0	0	—		NO	***
02 ppm		Test	<0.02	0						
	Mercenaria	Ref	<0.02	0	0	0	—		SIGNIF	***
		Test	<0.25	0						
	Nereis	Ref	<0.02	0	0	0	—		DIFFERENCE	***
		Test	<0.02	0						
	menida menida	Ref								***
)T		Test								
02 ppm	Mercenaria	Ref								***
		Test								
	Nereis	Ref								***
		Test								
	Palaemonetes	Ref								***
		Test								***
	Mercenaria	Ref								***
		Test								***
	Nereis	Ref								***
		Test								***
	Palaemonetes	Ref								***
		Test								***
	Mercenaria	Ref								***
		Test								***
	Nereis	Ref								***
		Test								***

tatistically Significant (95% confidence level)

[illegible] deviations were not determined since values were below detection limits

Table 6. ELUTRIATE TEST RESULTS (10 Day Laboratory Tests)

Applicant: PA of NY & NJ
PN/PE ~ Reach A

CHEMICAL CONSTITUENT	SITE WATER (S.D.)	ELUTRIATE (S.D.)	$\bar{d}$ DIFFERENCE |Site Water S.D. − Elutriate S.D.|	Calculated "F" Statistic $\left(\frac{\bar{d}}{SD\bar{d}}\right)^2$	DF	Tabular "F"	Is there a signif diff?
Petroleum Hydrocarb.	ND (<2.0)	ND (<2.0)					NO
PCB's	ND	ND	⊖	—	—		NO
Hg	<0.1 (0)	0.223 (0.074)	$\frac{>0.123}{0.043} = 2.88$	8.3	4	7.71	YES
Cd	0.064 (.007)	0.40 (0.012)	$\frac{0.336}{0.010} = 33.6$	1129	4	7.71	YES
DDT	ND	ND	⊖	—	—		NO

$$SDd = \sqrt{\frac{SDs^2 + SDe^2}{n}}$$

Values are in µg/l (ppb)

DF= Degrees of freedom
2(n-1)

ND = not detectable. Standard deviations were not determined since values were below detection limits.

JD 7/25/91

TABLE 7. BULK SEDIMENT ANALYSIS

Applicant: PA of NY & NJ / Port Elizabeth & Port Newark REACH A

n= 15	$\bar{x}$	S.D.	units
Cu	386.4	185.37	mg/Kg
Ni	57.92	18.94	mg/Kg
Zn	589.47	175.83	mg/Kg
% Moisture	55.23	5.52	%
Total organic C (loss on ignition)	29,970	6,246.57	mg/Kg

Where there were top & bottom samples analyzed (sites 11, 12, 13, 27) an average of the two was used as the number for that site: value

OLHA JO 3/7/91

TABLE 8. STANDARD TOXICANT ANALYSIS (96-Hr test)

Applicant: Port Authority of NY & NY
Ports Newark & Elizabeth
Reach A

Toxicant (Brand & grade): Sodium Lauryl Sulphate

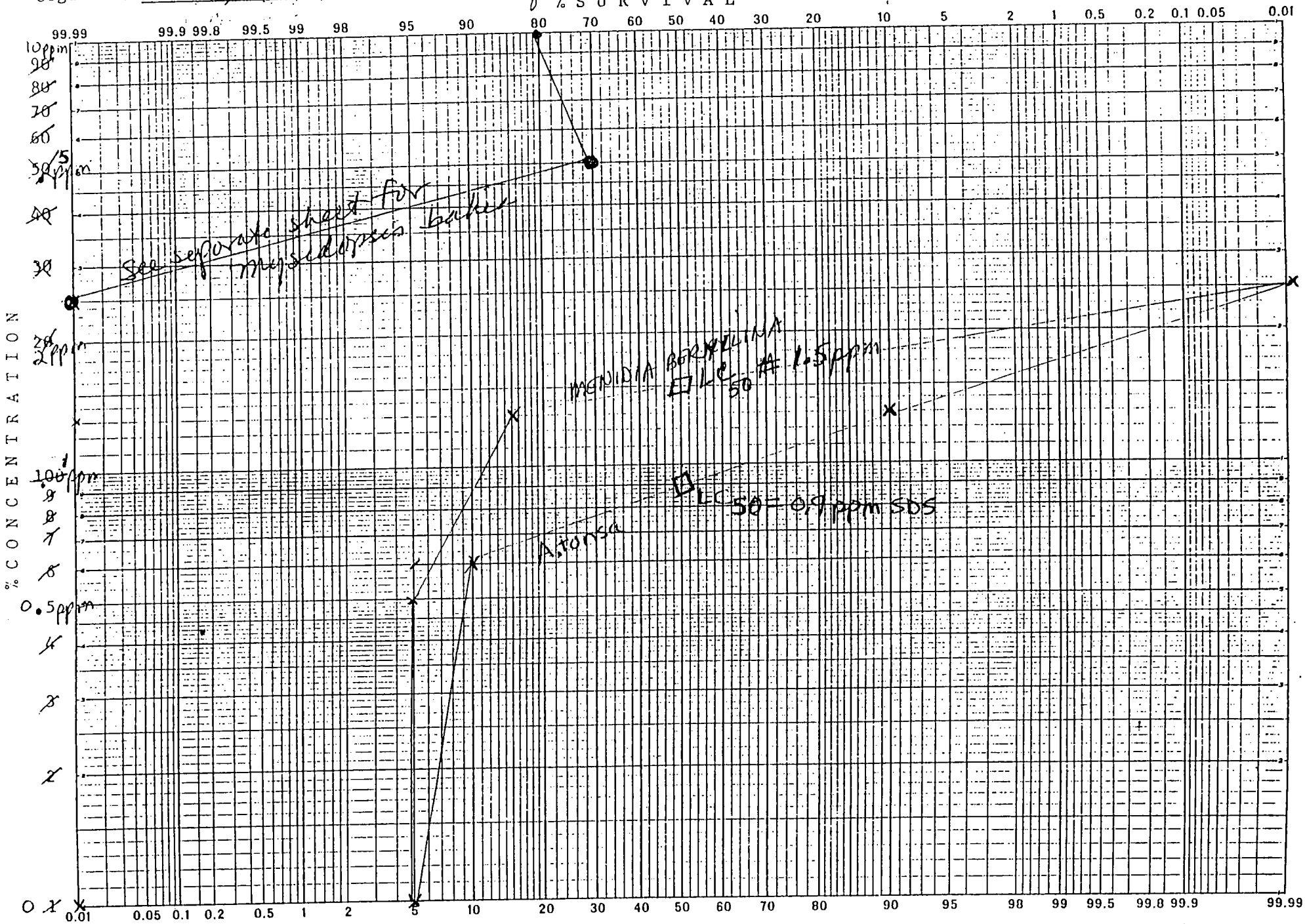
Artificial Seawater Mix: _____

ORGANISM	TEST START DATE	TEST FINISH DATE	TOXICANT CONC ~~(mg/l)~~ ppm	% SURV ~~or % RESP~~	96-HR EC50/LC50 ~~(mg/l)~~ ppm
Skeletonema costatum					
Acartia tonsa	6/8/90	6/12/90	0.0 ppm	95%	0.9
			0.6 ppm	90%	
			1.3 ppm	10%	
			2.5 ppm	0%	
			5.0 ppm	0%	
Mysidopsis bahia	6/9/90	6/13/90	0.0 ppm	100%	12.0
			1.3 ppm	100%	
			2.5 ppm	100%	
			5.0 ppm	70%	
			10.0 ppm	80%	
			25.0 ppm	0%	
Menidia beryllina	7/3/90	7/7/90	0.0 ppm	95%	1.5
			0.6 ppm	95%	
			1.3 ppm	85%	
			2.5 ppm	0%	
			5.0 ppm	0%	

to 3/28/91

Sodium lauryl Sulfate — Port Authority of NY & NJ — 7/8/71

Organism: A. tonsa; M. beryllina — Phase: Stand. Ref Toxicant — Applicant: PN/DE Reach A



NO. 3128. LOGARITHMIC PROBABILITY. DESIGNED BY HAZEN, WHIPPLE & FULLER. KEUFFEL & ESSER CO. GRAPH PAPER ® PRINTED IN U.S.A.

Liquid Phase

Organism: *Mysidopsis bahia* Phase: Stnd Ref Toxicant

Applicant: Port Auth of NY+NJ
PM/PE – Reael A

% SURVIVAL

99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

% CONCENTRATION

90 80 70 60 50 40 30 25 20 100 19 ppm 18 17 16 15 14 13 25 ppm 12 10 1 ppm 0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

M. bahia

LC50 = 12 ppm SLS

PA of NY & NJ
Port Elizabeth/Port Newark
Reach A

SECTION 404b EVALUATION

A) Elutriate Test Evaluation:

1. Mixing Zone Calculation (based on M.P. D-76-17)

Current Velocity: 0.7 Knots $\left(\frac{1.689 \text{ fps}}{\text{Knot}}\right)(.5) = 0.59$ fps

Rate of Overflow: _____

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (84 ft)
r= radius of source of overflow (84 ft)
λ= turbulent dissapation parameter (0.005)
X= horizontal distance from source
Vw= current velocity
d= depth of channel (42 ft)

Then $L = \sqrt{\left(\frac{t(\gamma) + 0.149\ R^{.66}}{0.094}\right)^3}$

$A = X\left(\frac{J_1 + 2r}{2}\right)$

$X = Vw \cdot t$

Volume of mixing zone (Vm)=

2. Dillution Calculations

% dilution of elutriate (De) = $\frac{\text{no marine standards -Ambient conc.}}{\text{Elutriate conc. -Standard conc.}} \times 100$

% dilution of overflow (D) = $\frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$

In order to meet water quality standards, the % dilution of overflow must not exceed the lowest % dilution of the elutriate necessary to reach ambient concentrations.

Chemical Constituent	De
Cd = .040 ppb	$\frac{.064}{.40} = .16 \times 100 = .16\%$

Comments: After 1 second, the % dilution of overflow does NOT exceed % dilution of elutriate

OLHA
3/29/91 JO

B) Bioassay Application:

1. Mixing Zone Calculation (based on M.P. D-76-17)

Current Velocity: 0.59 fps
Rate of Overflow*: 8.10 cfs

*On a "worst case" basis rate and duration of overflow equals the volume of liquid that one clamshell will hold per minute for no more than one-half hour. (This applies to barge overflow only)

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (84ft)
r= radius of source of overflow (84ft)
λ= turbulent dissapation parameter (0.005)
X= horizontal distance from source
Vw= current velocity
d= depth of channel (42 ft = maintenance depth)

Then $L = \sqrt{\left(\frac{E(\lambda) + 0.149\ R^{.66}}{0.094}\right)^3}$

$X = Vw \cdot t$

$A = X\left(\frac{L + 2r}{2}\right)$

Volume of mixing zone (Vm)= A·d

	Area x depth	Vm
at 1s	96.83 x 42	4067 cf
10s	950.33 x 42	41,174 cf
100s	11,009 x 42	462,367 cf

2. Dilution Calculation

Lowest L.P.C. from suspended particulate phase of bioassay: >4.0% for all organisms tested.

$$\% \text{ dilution (D)} = \frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$$

In order to meet water quality standards, the % dilution must not exceed the lowest L.P.C. for the suspended particulate phase of the bioassay.

At 1s, D = 0.20% which does NOT exceed the lowest LPC for the suspended particulate phase.

Enseco
A CORNING Company

June 28, 1990
Lab ID: 053096

Seymour Solomon
Port Authority of N.Y. & N.J.
241 Erie St. Rm. 234
Jersey City, New Jersey 07310-1397

Dear Mr. Solomon:

Enclosed is the report for the twelve silt samples for your Port Newark/Elizabeth Bioassay Project, Number P8-904.900/P5-904-900, which were received at Enseco-Cal Lab on 2 June 1990.

The report consists of the following sections:

I Sample Description
II Analysis Request
III Quality Control Report
IV Analysis Results

Due to lower than normal recoveries of the internal standards your sample Reach A Location #20 is being re-extracted. Results will be reported as soon as they are available.

If you have any questions, please feel free to call.

Sincerely,

Michael J. Miille, Ph.D.
Division Director

ak

Enseco Incorporated
2544 Industrial Boulevard
West Sacramento, California 95691
916/372-1393 Fax: 916 372-7768

I Sample Description

See the attached Sample Description Information.

The samples were received under chain-of-custody.

II Analysis Request

The following analytical test was requested.

Lab ID	Analysis Description
053096-1 thru 15	2,3,7,8-TCDD

III Quality Control

A. Project Specific QC. No project specific QC (i.e., spikes and/or duplicates) was requested.

B. Method Blank Results. A method blank is a laboratory-generated sample which assesses the degree to which laboratory operations and procedures cause false-positive analytical results for your samples.

No target parameters were detected in the method blank associated with your samples at or above the detection limits noted on the data sheet in the Analytical Result Section.

IV Analysis Results

Test methods for all analyses except chlorinated dioxins and furans, may include minor modifications of published EPA Methods such as reporting limits or parameter lists. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e., no correction is made for moisture content, unless the method requires or the client requests that such correction be made.

For pulp and paper industry samples, test methods for chlorinated dioxin/furan analyses will follow NCASI Technical Bulletin 551 unless otherwise noted. Pulp and sludge samples are air dried and prepared per this method. All results for these analyses, including detection limits, are reported on a dry weight basis.

Detection limits are reported on a sample specific basis. All results are recovery corrected per the isotope dilution technique.

Results are on the attached data sheets.

SAMPLE DESCRIPTION INFORMATION
for
Port Authority of N.Y & N.J.

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
053096-0001-SA	REACH A LOCATION #2	SOIL	31 MAY 90		02 JUN 90
053096-0001-MB	Method Blank	SOIL			02 JUN 90
053096-0002-SA	REACH A LOCATION #4	SOIL	30 MAY 90		02 JUN 90
053096-0003-SA	REACH A LOCATION #7	SOIL	30 MAY 90		02 JUN 90
053096-0004-SA	REACH A LOCATION #9	SOIL	30 MAY 90		02 JUN 90
053096-0005-SA	REACH A LOCATION #11 SAMPLE 1	SOIL	31 MAY 90		02 JUN 90
053096-0006-SA	REACH A LOCATION #11 SAMPLE 2	SOIL	31 MAY 90		02 JUN 90
053096-0007-SA	REACH A LOCATION #12 SAMPLE 1	SOIL	31 MAY 90		02 JUN 90
053096-0008-SA	REACH A LOCATION #12 SAMPLE 2	SOIL	31 MAY 90		02 JUN 90
053096-0009-SA	REACH A LOCATION #13 SAMPLE 1	SOIL	24 MAY 90		02 JUN 90
053096-0010-SA	REACH A LOCATION #13 SAMPLE 2	SOIL	24 MAY 90		02 JUN 90
053096-0011-SA	REACH A LOCATION #15	SOIL	24 MAY 90		02 JUN 90
053096-0012-SA	REACH A LOCATION #16	SOIL	24 MAY 90		02 JUN 90
053096-0013-SA	REACH A LOCATION #18	SOIL	25 MAY 90		02 JUN 90
053096-0014-SA	REACH A LOCATION #20	SOIL	25 MAY 90		02 JUN 90
053096-0015-SA	REACH A LOCATION #21	SOIL	25 MAY 90		02 JUN 90

Enseco

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Method Blank
Lab ID: 053096-0001-MB Enseco ID: 151043
Matrix: SOIL Sampled: NA Received: NA
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	ND	pg/g	0.83	
	% Recovery			
13C-2,3,7,8-TCDD	102			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #2
Lab ID: 053096-0001-SA Enseco ID: 151041
Matrix: SOIL Sampled: 31 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.10 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	100	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	96			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #4
Lab ID: 053096-0002-SA Enseco ID: 151045
Matrix: SOIL Sampled: 30 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	110	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	99			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #7
Lab ID: 053096-0003-SA Enseco ID: 151046
Matrix: SOIL Sampled: 30 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	130	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	109			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #9
Lab ID: 053096-0004-SA Enseco ID: 151048
Matrix: SOIL Sampled: 30 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	130	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	111			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #11 SAMPLE 1
Lab ID: 053096-0005-SA Enseco ID: 151049
Matrix: SOIL Sampled: 31 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	76	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	119			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #11 SAMPLE 2
Lab ID: 053096-0006-SA Enseco ID: 151061
Matrix: SOIL Sampled: 31 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	450	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	119			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #12 SAMPLE 1
Lab ID: 053096-0007-SA Enseco ID: 151051
Matrix: SOIL Sampled: 31 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	110	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	102			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #12 SAMPLE 2
Lab ID: 053096-0008-SA Enseco ID: 151062
Matrix: SOIL Sampled: 31 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.10 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	100	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	106			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

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Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #13 SAMPLE 1
Lab ID: 053096-0009-SA Enseco ID: 151052
Matrix: SOIL Sampled: 24 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	76	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	80			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

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Enseco

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #13 SAMPLE 2
Lab ID: 053096-0010-SA Enseco ID: 151063
Matrix: SOIL Sampled: 24 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	83	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	84			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #15
Lab ID: 053096-0011-SA Enseco ID: 151054
Matrix: SOIL Sampled: 24 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 26 JUN 90

Sample Amount 5.10 G
Percent Moisture NA
Column Type DB-DXN

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	83	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	94			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
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Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #16
Lab ID: 053096-0012-SA Enseco ID: 151056
Matrix: SOIL Sampled: 24 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 26 JUN 90

Sample Amount 5.10 G
Percent Moisture NA
Column Type DB-DXN

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	140	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	103			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

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Enseco

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #18
Lab ID: 053096-0013-SA Enseco ID: 151058
Matrix: SOIL Sampled: 25 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 26 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-DXN

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	98	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	115			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
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Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: REACH A LOCATION #21
Lab ID: 053096-0015-SA Enseco ID: 151060
Matrix: SOIL Sampled: 25 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 14 JUN 90 Analyzed: 26 JUN 90

Sample Amount 5.00 G
Percent Moisture NA
Column Type DB-DXN

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	98	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	107			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco
A CORNING Company

June 26, 1990
Lab ID: 053097

Seymour Solomon
Port Authority of New York and New Jersey
241 Erie Street Room 234
Jersey City, New Jersey 07310-1397

Dear Mr. Solomon:

Enclosed is the report for the thirteen silt samples for your Port Newark/Elizabeth Bioassay Project, Number P8-904.900, P5-904.900, which were received at Enseco-Cal Lab on 2 June 1990.

The report consists of the following sections:

I Sample Description
II Analysis Request
III Quality Control Report
IV Analysis Results

If you have any questions, please feel free to call.

Sincerely,

Michael J. Miille, Ph.D.
Division Director

ke

Enseco Incorporated
2544 Industrial Boulevard
West Sacramento, California 95691
916 372-1393 Fax: 916 372-7768

I Sample Description

See the attached Sample Description Information.

The samples were received under chain-of-custody.

II Analysis Request

The following analytical test was requested.

Lab ID	Analysis Description
053097-1 thru 13	2,3,7,8-TCDD

III Quality Control

A. Project Specific QC. No project specific QC (i.e., spikes and/or duplicates) was requested.

B. Method Blank Results. A method blank is a laboratory-generated sample which assesses the degree to which laboratory operations and procedures cause false-positive analytical results for your samples.

No target parameters were detected in the method blank associated with your samples at or above the detection limits noted on the data sheet in the Analysis Results Section.

IV Analysis Results

Test methods for all analyses except chlorinated dioxins and furans, may include minor modifications of published EPA Methods such as reporting limits or parameter lists. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis, i.e., no correction is made for moisture content, unless the method requires or the client requests that such correction be made.

For pulp and paper industry samples, test methods for chlorinated dioxin/furan analyses will follow NCASI Technical Bulletin 551 unless otherwise noted. Pulp and sludge samples are air dried and prepared per this method. All results for these analyses, including detection limits, are reported on a dry weight basis.

Detection limits are reported on a sample specific basis. All results are recovery corrected per the isotope dilution technique.

Results are on the attached data sheets.

SAMPLE DESCRIPTION INFORMATION
for
Port Authority of N.Y & N.J.

Lab ID	Client ID	Matrix	Sampled Date	Sampled Time	Received Date
053097-0001-SA	Reach A #23	SOIL	25 MAY 90		02 JUN 90
053097-0001-MB	Method Blank	SOIL			02 JUN 90
053097-0002-SA	Reach A #26	SOIL	25 MAY 90		02 JUN 90
053097-0003-SA	Reach A #27	SOIL	25 MAY 90		02 JUN 90
053097-0004-SA	Reach C #37	SOIL	23 MAY 90		02 JUN 90
053097-0005-SA	Reach C #39	SOIL	23 MAY 90		02 JUN 90
053097-0006-SA	Reach C #41	SOIL	23 MAY 90		02 JUN 90
053097-0007-SA	Reach C #43	SOIL	23 MAY 90		02 JUN 90
053097-0008-SA	Reach C #45	SOIL	23 MAY 90		02 JUN 90
053097-0009-SA	Reach C #47	SOIL	22 MAY 90		02 JUN 90
053097-0010-SA	Reach C #50	SOIL	22 MAY 90		02 JUN 90
053097-0011-SA	Reach C #54	SOIL	22 MAY 90		02 JUN 90
053097-0012-SA	Reach A #27-Sample #2	SOIL	25 MAY 90		02 JUN 90
053097-0013-SA	Reach C #45-Sample #2	SOIL	23 MAY 90		02 JUN 90

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Method Blank
Lab ID: 053097-0001-MB Enseco ID: 151035
Matrix: SOIL Sampled: NA Received: NA
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	ND	pg/g	1.0	
	% Recovery			
13C-2,3,7,8-TCDD	77			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach A #23
Lab ID: 053097-0001-SA Enseco ID: 151034
Matrix: SOIL Sampled: 25 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	99	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	94			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach A #26
Lab ID: 053097-0002-SA Enseco ID: 151036
Matrix: SOIL Sampled: 25 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD.	77	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	79			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach A #27
Lab ID: 053097-0003-SA
Matrix: SOIL
Authorized: 02 JUN 90

Enseco ID: 151037
Sampled: 25 MAY 90
Prepared: 13 JUN 90

Received: 02 JUN 90
Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	63	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	73			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier

Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #37
Lab ID: 053097-0004-SA Enseco ID: 151039
Matrix: SOIL Sampled: 23 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	76	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	96			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #39
Lab ID: 053097-0005-SA Enseco ID: 151040
Matrix: SOIL Sampled: 23 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	36	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	67			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
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Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #41
Lab ID: 053097-0006-SA Enseco ID: 151042
Matrix: SOIL Sampled: 23 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	430	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	54			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #43
Lab ID: 053097-0007-SA Enseco ID: 151044
Matrix: SOIL Sampled: 23 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	45	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	30			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #45
Lab ID: 053097-0008-SA Enseco ID: 151047
Matrix: SOIL Sampled: 23 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	37	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	22			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #47
Lab ID: 053097-0009-SA Enseco ID: 151053
Matrix: SOIL Sampled: 22 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	75	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	92			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #50
Lab ID: 053097-0010-SA Enseco ID: 151055
Matrix: SOIL Sampled: 22 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	140	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	40			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #54
Lab ID: 053097-0011-SA Enseco ID: 151057
Matrix: SOIL Sampled: 22 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	64	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	88			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach A #27-Sample #2
Lab ID: 053097-0012-SA Enseco ID: 152367
Matrix: SOIL Sampled: 25 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	210	pg/g	--	
	% Recovery			
13C-2,3,7,8-TCDD	104			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

2,3,7,8-TCDD

HIGH RESOLUTION

Client Name: Port Authority of N.Y & N.J.
Client ID: Reach C #45-Sample #2
Lab ID: 053097-0013-SA Enseco ID: 152368
Matrix: SOIL Sampled: 23 MAY 90 Received: 02 JUN 90
Authorized: 02 JUN 90 Prepared: 13 JUN 90 Analyzed: 22 JUN 90

Sample Amount 5.0G
Percent Moisture NA
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Dioxins				
2,3,7,8-TCDD	ND	pg/g	1.2	
	% Recovery			
13C-2,3,7,8-TCDD	106			

ND = Not detected
NA = Not applicable

Reported By: Martha Maier Approved By: Mike Filigenzi

The cover letter is an integral part of this report.
Rev 230787

Enseco

CHAIN-OF-CUSTODY RECORD

SAMPLER: (*Signature*)

Date Shipped _____ Carrier _____

one (201)-963-2993 Airbill No. _____ Cooler No. _____

SHIP TO:
Enseco-Cal Lab
2544 Industrial Blvd.
West Sacramento, CA 95691
(916) 372-1393
ATTENTION: M. MILLE

SEND RESULTS TO:
Client Name S. M. SOLOMON
Company PORT AUTHORITY OF NY - NJ
Address 241 ERIE STREET RM 234
JERSEY CITY NJ 07310-1397
Phone (201) 963-2993

PROJECT NAME PORT NEWARK/ELIZABETH PROJECT NO. _____ P.O. NO. _____
BIOASSAY PB-904.900 / PS-904-900

Relinquished by: (*Signature*)	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Received at lab by: (*Signature*)	Date	Time
Relinquished from lab by: (*Signature*)	Received by: (*Signature*)	Date	Time

ANALYSIS REQUEST

Sample ID Number	Sample Description	Date/Time Sampled	Analysis Requested	Sample Condition Upon Receipt
REACH A SAMPLE #2	SILT	5/31/90	TCDD (2,3,7,8) 1ppt in	
" A # 4	"	5/30/90	"	
" A # 7	"	5/30/90	"	
" A # 9	"	5/30/90	"	
" A # 11	"	5/31/90	"	
" A # 12	"	5/31/90	"	
" A # 13	"	5/24/90	"	
" A # 15	"	5/24/90	"	
" A # 16	"	5/24/90	"	
" A # 18	"	5/25/90		

Special Instructions/Comments:

NOTE: UNUSED PORTIONS OF NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

Expected Analytical T.A.T's: _____ Immediate Attention (200% surcharge) _____ RUSH (50-100% surcharge) _____ Standard

Cal Lab ID Number: (*for lab use only*)

Client Retains White Copy Only

(Revised 1 [illegible])

Enseco

CHAIN-OF-CUSTODY RECORD

SAMPLER: (*Signature*)

one (201) 963-2993

Date Shipped _____ Carrier _____

Airbill No. _____ Cooler No. _____

SHIP TO:

Enseco-Cal Lab
2544 Industrial Blvd.
West Sacramento, CA 95691
(916) 372-1393

ATTENTION: M MILLE

SEND RESULTS TO:

Client Name SM SOLOMON

Company PORT AUTHORITY OF NY NJ

Address 241 ERIE STREET BY 234
JERSEY CITY NJ 07310-1397

Phone (201) 963-2993

PROJECT NAME PORT NEWARK / ELIZABETH PROJECT NO. _____ P.O. NO. _____
BIOASSAY PS-904.900 PS-904.900

Relinquished by: (*Signature*)	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	Received at lab by: (*Signature*)	Date	Time
Relinquished from lab by: (*Signature*)	Received by: (*Signature*)	Date	Time

ANALYSIS REQUEST

Sample ID Number	Sample Description	Date/Time Sampled	Analysis Requested	Sample Condition Upon Receipt
REACH A SAMPLE #20		5/25/90	TCDD (2,3,7,8) 1 PPB	
" A #21	SILT	"	"	
" A #23	"	"	"	
" A #26	"	"	"	
" A #27	"	"	"	
REACH C #37	"	5/23/90	"	
" C #39	"	"	"	
" C #41	"	"	"	
" C #43	"	"	"	

Special Instructions/Comments:

NOTE: UNUSED PORTIONS OF NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

Expected Analytical A.T's: _____ Immediate Attention (200% surcharge) _____ RUSH (50-100% surcharge) _____ Standard

Cal Lab ID Number: *(for lab use only)*

Client Retains White Copy Only

(Revised 1 5

Enseco

CHAIN-OF-CUSTODY RECORD

SAMPLER: (*Signature*)

Phone (201) - 963 - 2993 Date Shipped _____ Carrier _____

Airbill No. _____ Cooler No. _____

SHIP TO:

Enseco-Cal Lab
2544 Industrial Blvd.
West Sacramento, CA 95691
(916) 372-1393
ATTENTION: M. MILLE

SEND RESULTS TO:

Client Name S M SOLOMON
Company PORT AUTHORITY NY NJ
Address 241 ERIE ST. (M 334
JERSEY CITY NY 07310 1397
Phone (201) 963 2993

PROJECT NAME PORT NEWARK / ELIZABETH PROJECT NO. _____ P.O. NO. _____
BIOASSAY PS-904.900 PS-904.900

		Date	Time
Relinquished by: (*Signature*)	Received by: (*Signature*)		
Relinquished by: (*Signature*)	Received by: (*Signature*)		
Relinquished by: (*Signature*)	Received at lab by: (*Signature*)		
Relinquished from lab by: (*Signature*)	Received by: (*Signature*)		

ANALYSIS REQUEST

Sample ID Number	Sample Description	Date/Time Sampled	Analysis Requested	Sample Condition Upon Receipt
SECHC#45	SILT	5/23/90	TCDA (2378) 10 DAY TA	
" C #47	"	5/22/90		
" C #50	"	"		
" C #54	"	"		

Special Instructions/Comments:

NOTE: UNUSED PORTIONS OF NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

Expected Analytical T.A.T's: Immediate Attention (200% surcharge) ____ RUSH (50-100% surcharge) ____ Standard

Cal Lab ID Number: *(for lab use only)*

Client Retains White Copy Only

(Revised

CHAIN OF CUSTODY RECORD

PROJECT: Port Newark | Eliz. Bio Assay

SAMPLING DATA

SAMPLE NO.	~~BORING NO.~~	DATE	TIME SAMPLED	TOTAL NO. OF BORING SAMPLES
	Reach C	5/22/90 5/23/90		

SIGNATURE OF ALL PRESENT AT SAMPLING: Piranello

RELINQUISHED BY (SIGN) Piranello	DATE/TIME 5/23/90	RECEIVED BY (SIGN)	
RELINQUISHED BY (SIGN)	DATE/TIME	RECEIVED BY (SIGN)	
RELINQUISHED BY (SIGN)	DATE/TIME 6-2-90	RECEIVED BY LAB R Bonaly	

TESTS REQUESTED — NAME OF LAB: Enseco Calif. Analytical La

REMARKS:
10. gallons Site Water
20. gallons Sediment
20. pint jars — Rec'd 9 pint jars for Reach C only in this shi
40. quart jars

NOTE: ALL SAMPLES MUST ALSO BE IDENTIFIED WITH A SAMPLE TAG. THE INFORMATION THAT MUST BE FILLED OUT ON THI
TAG SHALL INCLUDE THE PROJECT NAME, WELL POINT NUMBER, DATE, TIME, SIGNATURE OF SAMPLERS, AND TAG NUM

CHAIN OF CUSTODY RECORD

PROJECT: Newark/Elizabeth Bio Assay

SAMPLING DATA

SAMPLE NO.	~~BORING NO.~~ REACH A	DATE 5/24-25/90 5/29-31/90	TIME SAMPLED	TOTAL NO. OF BORING SAMPLES

SIGNATURE OF ALL PRESENT AT SAMPLING: [signature]

RELINQUISHED BY (SIGN)	[signature]	DATE/TIME 5/31/90	RECEIVED	BY (SIGN)	[signature]
RELINQUISHED BY (SIGN)		DATE/TIME	RECEIVED	BY (SIGN)	
RELINQUISHED BY (SIGN)		DATE/TIME 6-2-90	RECEIVED BY LAB		Robert Bono

TESTS REQUESTED — NAME OF LAB: Enseco Calif. Analytical Lab

REMARKS:

10-Gallons Site Water
20-Gallons Sediment
31-Pint jars
62-Quart jars

Rec'd 19 pint jars in this shipment only.
DTE ③ 6-2-90

NOTE: ALL SAMPLES MUST ALSO BE IDENTIFIED WITH A SAMPLE TAG. THE INFORMATION THAT MUST BE FILLED OUT ON TAG SHALL INCLUDE THE PROJECT NAME, WELL POINT NUMBER, DATE, TIME, SIGNATURE OF SAMPLERS, AND TAG NU

Public Notice No. 14515-91-1028-C

17 October 1991

CENAN-OP-W

MEMORANDUM FOR: Chief, Regulatory Branch

SUBJECT: Review of bioassay testing for Ocean Disposal of Dredged Material: Port Authority of New York and New Jersey, Port Newark/Port Elizabeth, Reaches B,C,& D. Newark Bay, New Jersey.

1. We have evaluated the bioassay test results to determine the material's suitability for ocean disposal at the Mud Dump site.

2. Results of the testing have determined the following:

Reach B. 10-day bioassay/bioaccumulation

Bioassay test results for Nereis indicate a greater than 10% difference in survival between test and reference organisms; however, this difference is not statistically significant.
Total community mortality was statistically significantly higher in test organisms, but the difference was less than 10%.

Bioaccumulation test results for **petroleum hydrocarbons** indicate a statistically significant bioaccumulation in the worm, Nereis virens. There is presently no matrix guideline value for this class of chemical constituents.

Bioaccumulation testing results for **PCBs** indicate a statistically significant bioaccumulation in both Palaemonetes pugio and Mercenaria mercenaria. Levels in both organisms were **below** matrix values.

There is a statistically significant difference in the cadmium concentration in the elutriate compared to the site water; however, this will dilute to environmentally acceptable levels within a reasonable period of time.

28-day bioassay/bioaccumulation

2,3,7,8-TCDD levels were detected in test sediment in concentrations greater than 1 pptr.

2,3,7,8-TCDD levels in bioaccumulation testing were significantly different in test organisms when compared to reference organisms.

Reach C. 10-day bioassay/bioaccumulation

Bioassay test results for Nereis indicate a greater than 10% difference in survival between test and reference organisms; however, this difference is not statistically significant.
There is a statistically significant difference in the cadmium concentration in the elutriate compared to the site water, which will dilute to environmentally acceptable levels within a reasonable period of time.

28-day bioassay/bioaccumulation

2,3,7,8-TCDD levels were detected in test sediment in concentrations greater than 1 pptr.

2,3,7,8-TCDD levels in bioaccumulation testing were significantly different in test organisms when compared to reference organisms.

Reach D. 10-day bioassay/bioaccumulation

There is a statistically significant bioaccumulation of **petroleum hydrocarbons** in the grass shrimp, **Palaemonetes**. There is currently no matrix guideline value for this chemical compound class.

There is a statistically significant difference in the cadmium concentration in the elutriate compared to the site water, which will dilute to environmentally acceptable levels within a reasonable period of time.

28-day bioassay/bioaccumulation

2,3,7,8-TCDD levels were detected in test sediment in concentrations greater than 1 pptr.

2,3,7,8-TCDD levels in bioaccumulation testing were significantly different in test organisms when compared to reference organisms.

3. The environmental significance of bioaccumulation of petroleum hydrocarbons is, at present, undetermined. Levels of PCB bioaccumulation were below the Interpretive Guidance Levels (i.e., the "matrix") for the Mud Dump Site, and therefore, do not pose an environmental risk.

   The environmental significance of bioaccumulation of 2,3,7,8-TCDD is not yet understood. The interagency dioxin steering committee has agreed that ocean disposal

of sediments producing dioxin bioaccumulation levels greater than 4 pptr would require de facto capping at the Mud Dump Site. You are reminded that this project must be scheduled to coincide with other dredging projects to ensure the availability of cap material.

4. As indicated in the attached Memo, results of bioassay/bioaccumulation testing indicate that the proposed dredged material does meet current ocean disposal testing criteria and can, therefore, be disposed at the Mud Dump Site, with the provision of de facto capping.

5. Questions concerning this analysis can be directed to Joe Olha of my staff at X5621.

Monte Greges

Monte Greges
Chief, Water Quality
Compliance Branch

Reach 5

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
CENANOP-W	Review of Bioassay Data: PA of NY & NJ Port Newark / Port Elizabeth Reach B

TO MEMO FOR THE RECORD

FROM C, Water Quality Compliance Branch

DATE ~~3/24/91~~ 10/10/91 CMT 1
OLHA JO x5621 JO

1. Enclosed is an interpretive summary of results of three-phased bioassays performed on dredged material composited from 3 sampling sites (shown on inclosed map) located in Newark Bay @ PNPE ~ Reach B. Bioassays were run in accordance with "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters", which is the Implementation Manual for Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972. At the time that samples were collected, the 21 Dec 84 edition of the NYD/EPA Region 2 Guidance Manual was in effect.

2. Bioassays were performed by ENSECO Labs (Marblehead and Cambridge, Mass). Samples were collected on *See below and test results were completed on July 1990, and reported on December 1990.

3. All samples consisted of cores to project depth. According to the testing laboratory's report, stratification was NOT observed in sample cores. Grain size analyses indicate the proposed material to average: 2.7 % sand
61.3 % silt
36.0 % clay

4. Analysis of the results for the three phases indicates that the LPC for this material is within acceptable limits as defined in the EPA Ocean Dumping Regulations and the Corps/EPA Implementation Manual.**

5. Results of bioaccumulation analyses performed on organisms surviving the solid phase testing are also inclosed. An evaluation of these data indicates that the proposed dredged material does not exhibit an environmentally significant bioaccumulation potential.

Incl
as

MONTE P. GREGGS
Chief, Water Quality Compliance Branch

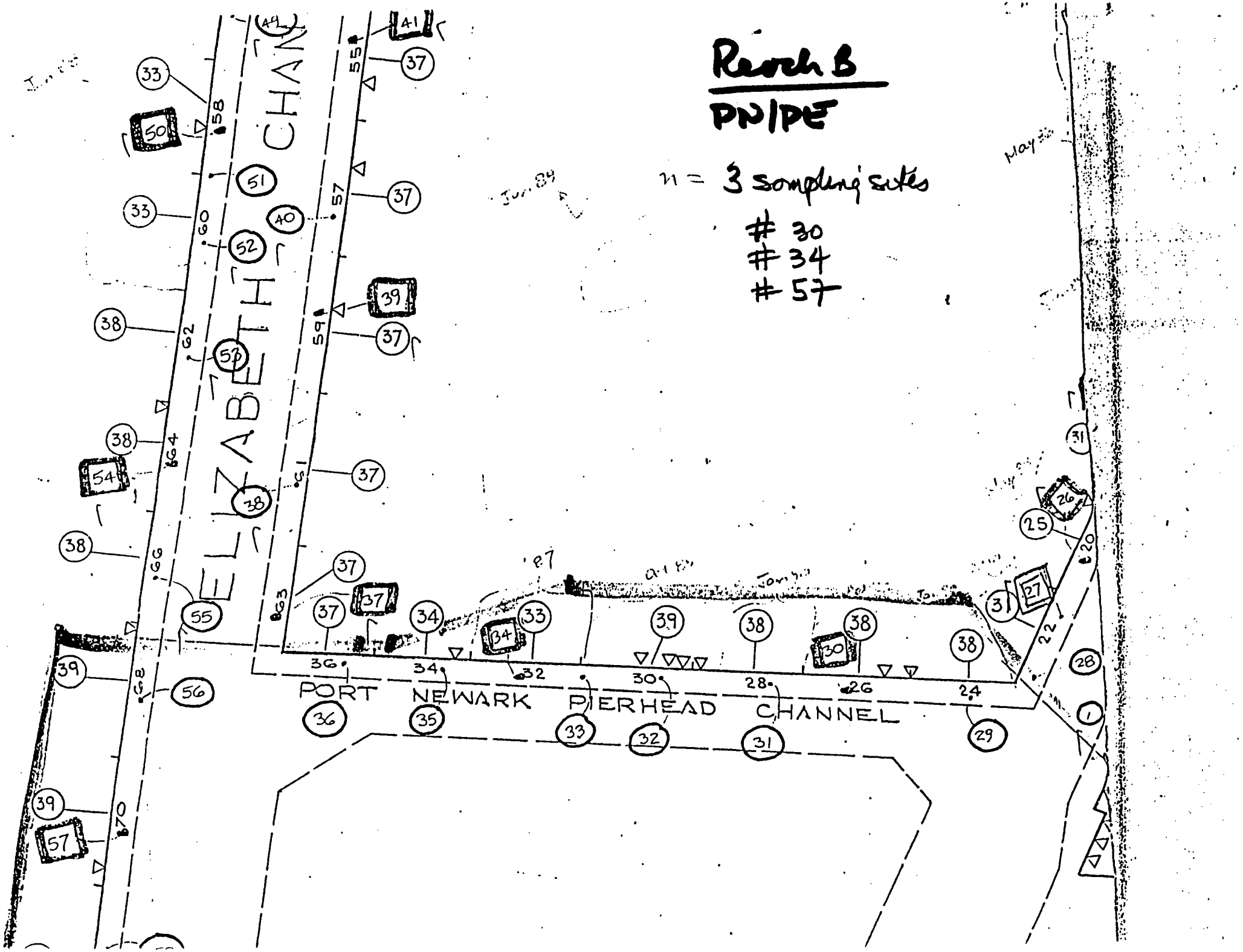
* SAMPLE COLLECTION

Test samples	5/14-5/31, 1990	by DA of NY & NJ
Reference sample	5/16/1990	by Aqua Survey, Inc
Control "	5/22/90	by Aqua Survey, Inc

OLHA/x5621
JO 10/10/91 JO

** It is determined that de facto capping will be necessary.
JO 10/10/91
OLHA x5621

GOVERNMENT PRINTING OFFICE: 1982-372-711


Reach B
PNIPE
n = 3 sampling sites
# 30
# 34
# 57
ELIZABETH CHANNEL
PORT NEWARK PIERHEAD CHANNEL

Applicant: _____

Table 1. BIOASSAY RESULTS

	LC_{50} or EC_{50} (critical)	LPC after 4 hours	DILUTION after 4 hours
LIQUID PHASE (96-hour test)			
Skeletomena costatum			
Mysidopsis bahia			
Menidia ~~menidia~~			
SUSPENDED PHASE (96-hour test)			
Acartia tonsa	76%	.76%	0.0043%
Mysidopsis bahia	>100%	1.0%	0.0043%
Menidia ~~menidia~~	>100%	1%	0.0043%

LC_{50} - Lethal Concentration resulting in 50% mortality
EC_{50} - Effective Concentration resulting in 50% inhibition (applies to phytoplankton)
LPC - Limiting Permissible Concentration (0.01 times critical EC_{50} or LC_{50})

	% SURVIVAL			COMPARISON OF REFERENCE & TEST SEDIME								
	Control	Reference	Test	$\bar{d} = \lvert\bar{X}_R - \bar{X}_T\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2+S_T^2}{n}}$	calculated $F = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	K	$\nu = K(n-1)$	Table F	Is Stat sign
	$\bar{X}$ S	$\bar{X}_R$ S_R	$\bar{X}_T$ S_T								
SOLID PHASE (10-day test)											
Paleomonetes	94.0 (2.65)	93.8 (4.32)	87.0 (15.54)	6.8	7.21	0.89	5	2	8	5.32	N
Mercenaria mercenaria	100.0 (0.00)	100.0 (0.00)	100.0 (0.00)	0.0	0.00	0.00	5	2	8	5.32	N
Nereis virens	98.33 (2.58)	92.0 (5.70)	81.0 (12.44)	11.0	6.32	3.03	5	2	8	5.32	N
Total Community	97.44 (3.32)	95.27 (5.22)	89.33 (13.57)	8.35	3.75	4.96	15	2	28	4.19	Y

organisms/species/replicates

replicates

Total # organisms/test

* - significant at 95% confidence level
SD_c - standard deviation of control
SD_t - standard deviation of test sediment
SD_d - standard deviation of difference between means
D.F. - degrees of freedom
SD_r - standard deviation of reference sediment

Table 3. SUSPENDED PARTICULATE PHASE BIOASSAY RESULTS (96 hr test)

Applicant: I + Authority of NY & NJ
PN/PE ~ Reach B

Acartia tonsa (copepod)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC_{50}
4 hr	100%	100%	100%	100%	>100%
8 hr	100%	100%	100%	100%	>100%
24 hr	98%	98%	100%	68%	>100%
48 hr	98%	98%	100%	35%	92%
72 hr	92%	98%	90%	25%	78%
96 hr	92%	95%	88%	22%	76%

(# organisms/test)

Mysidopsis bahia (mysid shrimp)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC50
4 hr	100%	100%	100%	100%	>100%
8 hr	↓	↓	↓	↓	↓
24 hr					
48 hr					
72 hr					
96 hr					

(#organisms/test)

Menidia ~~menidia~~ beryllina (fish)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC50
4 hr	100%	100%	100%	100%	>100%
8 hr	↓	100%	100%	100%	↓
24 hr		100%	100%	100%	
48 hr		98%	100%	98%	
72 hr		97%	98%	98%	
96 hr	✓	97%	95%	95%	

(#organisms/test)

LC_{50} - Lethal Concentration resulting in 50% mortality

JO 3/29/91

Table 4. Dilution Evaluation Based on the Tetra Tech Model

Applicant: Port Authority of NY & NJ
PN/PE - Reach B

The dilution of the proposed dredged material has been evaluated by use of the Tetra Tech computer model. A description of the model has been published as Technical Report D-78-47 of the Corps' Dredged Material Research Program, and is entitled Evaluation and Calibration of the Tetra Tech Dredged Material Disposal Models Based on Field Data. The New York District requested that a study be conducted which would give example dilutions resulting from typical disposal operations and dredged materials found in the New York District. This study has been completed and is entitled Discussion of Dredged Material Disposal Models and Their Application for the New York District.

This evaluation is based on model run number 12, which most closely approximates the project disposal operations and dredged material.

Based on this model run, the dilution of the material at four hours is predicted to be 0.0043 %.

The model run selected most closely approximates the project material for the parameter of percent moisture content, because this parameter is the most sensitive.

Moisture content is 52.77%.

Table 5. P CUMULATION TEST RESULTS. (10 Day Laboratory Test

Applicant: Port Authority of NY & NJ
PN/DE — Pearl B

JG 3/29/94

n=5

			$\bar{x}$	S	$\bar{d} = \lvert \bar{x}_{ref} - \bar{x}_{test} \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{ref}^2 + S_{test}^2}{n}}$	Calculated $F' = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$ / Table "F"	C.V. = $\frac{S}{\bar{x}}$ Ref. & Test (5 reps)	Sub-samples (3 reps)	Is differen Stat. Sig.?
Pet Hydro 0.10ppm	Palaemonetes pugio	Ref	5.19	3.22	34.53	25.15	1.89 / 5.318			NO
		Test	39.72	56.15						
	Mercenaria mercenaria	Ref	11.22	7.58	9.72	4.25	5.23			NO
		Test	20.94	5.74						
	Nereis virens	Ref	8.29	3.72	12.97	3.16	16.84			YES
		Test	20.66	6.01						
PCB * 0.04ppm	Palaemonetes pugio	Ref	0.02	0	0.026	.011	5.59			YES
		Test	0.046	0.025						
	Mercenaria mercenaria	Ref	0.02	0	0.040	.011	12.80			YES
		Test	0.060	0.025						
	Nereis virens	Ref	0.045	0.012	0.111	.050	4.93			NO
		Test	0.156	0.111						
Hg 0.20ppm	Palaemonetes pugio	Ref	<0.20	**	0	0				NO
		Test	<0.20	**						
	Mercenaria mercenaria	Ref	<0.20	**	0	0				NO
		Test	<0.20	**						
	Nereis virens	Ref	<0.20	**	0	0				NO
		Test	<0.20	**						
Cd 0.25ppm	Palaemonetes pugio	Ref	<0.25	**	0	0				NO
		Test	<0.25	**						
	Mercenaria mercenaria	Ref	<0.25	**	0	0				NO
		Test	<0.25	**						
	Nereis virens	Ref	<0.25	**	0	0				NO
		Test	<0.25	**						

*Statistically Significant (95% confidence level)

* [PCB] of <0.04ppm is considered to be 0.02 ppm;

** Standard deviation, where undetermined, is zero (0).

Table 5. BIOACCUMULATION TEST RESULTS. (10 Day Laboratory Te

Applicant: _____

			n= 5	$\bar{x}$	S	$\bar{d} = \lvert \bar{x}_{Ref} - \bar{x}_{Test} \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{Ref}^2 + S_{Test}^2}{n}}$	Calculated "F" $= \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	C.V. $= \frac{S}{\bar{x}}$ Ref. & Test (5 reps.)	C.V. $= \frac{S}{\bar{x}}$ Sub-samples (3 reps.)	Signif. dif.
DDT 0.02 ppm	Palaemonetes	Ref		<0.02	**	0	Ø				***
		Test		<0.02	**						No
	Mercenaria	Ref		<0.02	**	0	Ø				***
		Test		<0.02	**						No
	Nereis	Ref		<0.02	**	0	Ø				2
		Test		<0.02	**						***
DDT 0.02 ppm	Menida menida	Ref									
		Test									***
	Mercenaria	Ref									
		Test									***
	Nereis	Ref									
		Test									***
	Palaemonetes	Ref									***
		Test									***
	Mercenaria	Ref									**
		Test									***
	Nereis	Ref									***
		Test									***
	Palaemonetes	Ref									***
		Test									***
	Mercenaria	Ref									***
		Test									***
	Nereis	Ref									***
		Test									

*statistically Significant (95% confidence level)

** Standard deviation is undetermined sin
the value were below detection lim

Table 6. ELUTRIATE TEST RESULTS (10 Day Laboratory Tests) $n=3$

Applicant: PORT AUTHORITY OF N/J/N.Y.
PIER B

CHEMICAL CONSTITUENT	SITE WATER (S.D.)	ELUTRIATE (S.D.)	$\bar{d}$ DIFFERENCE |Site Water S.D − Elutriate S.D|	$SD_{\bar{d}}$	CALCULATED "F" Statistic $\left(\frac{\bar{d}}{SD_{\bar{d}}}\right)^2$	DF	TABLE "F" VALUE	IS DIFF STAT SIG AT 95% CONFIDENCE LEVEL
Petroleum Hydrocarb.	<2.0	<2.0	0	—	—	4	7.71	NO
PCB's	<0.1	<0.1	0	—	—			NO
Hg	<0.1	<0.1	0	—	—	4	7.71	NO
Cd	0.076 (.0139)	0.457 (.0058)	0.381	.0088	1860	4	7.71	YES
DDT	<0.05	<0.05	0.1		—			NO

$$SDd = \sqrt{\frac{SDs^2 + SDe^2}{n}}$$

Values are in µg/l (ppb)

DF= Degrees of freedom
2(n-1)

OLHA X5621
4/29/91
10/15/91

TABLE 7. BULK SEDIMENT ANALYSIS

Applicant: Port Authority of NY & NJ
PNIPE - Reach B

n=3	$\bar{x}$	S.D.	units
Cu	163.7	52.3	mg/Kg
Ni	29.0	4.7	mg/Kg
Zn	269.0	75.2	mg/Kg
% Moisture	52.77	6.71	%
Total organic C (loss on ignition)	35,700	10,233	mg/Kg.

JO 3/24/

TABLE 8. STANDARD TOXICANT ANALYSIS (96-Hr test)

Applicant: Port Authority of NY & NJ
PN/PE - Reed B.

Toxicant (Brand & grade): Sodium dodecyl sulfate

Artificial Seawater Mix: _____

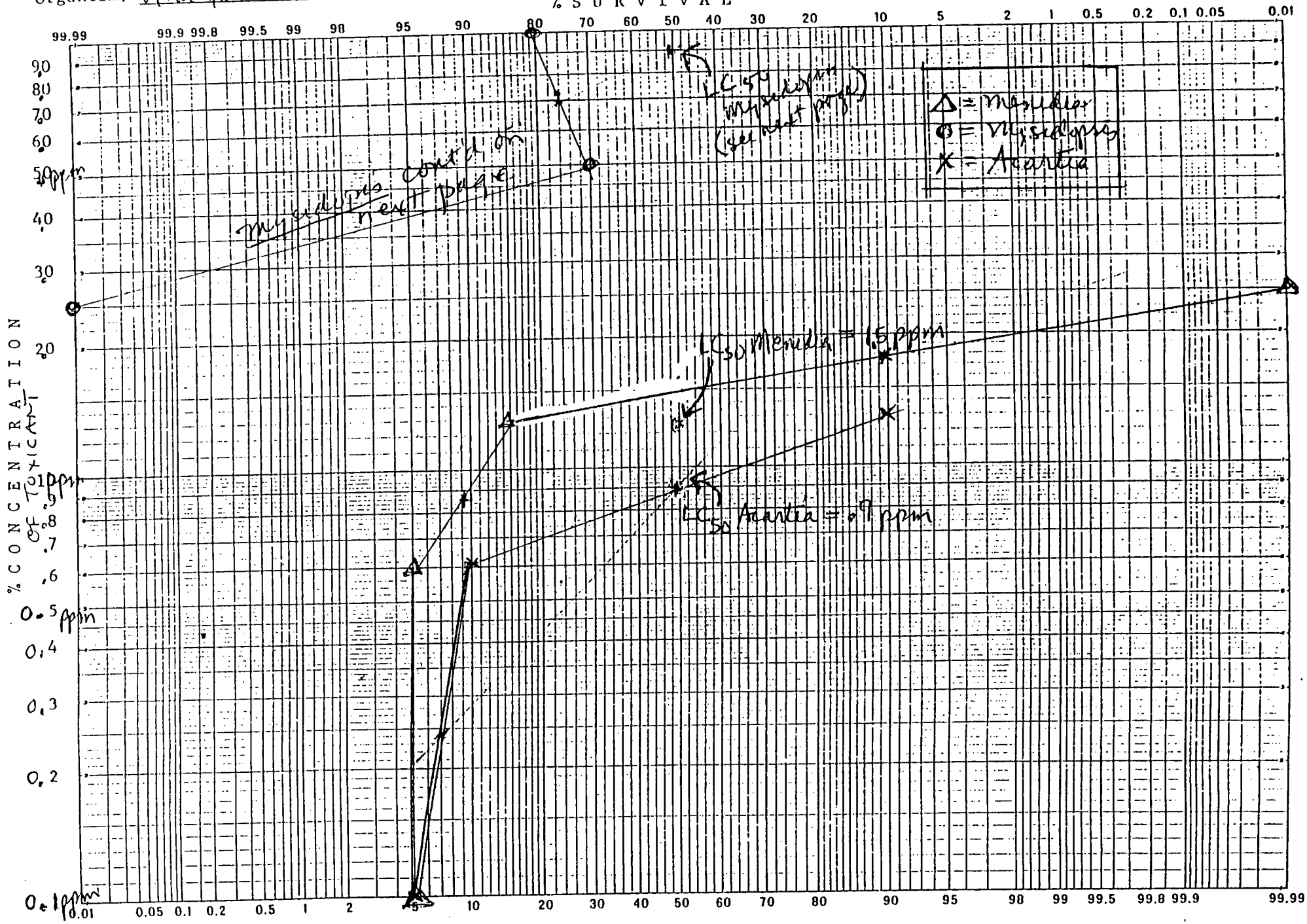
ORGANISM	TEST START DATE	TEST FINISH DATE	TOXICANT CONC (mg/l) ppm	% SURV ~~or % RESP~~	96-HR EC50/LC50 (mg/l)
Skeletonema costatum					
Acartia tonsa	6/8/91	6/12/90	0.0	95%	0.9 ppm
			0.6	90%	
			1.3	10%	
			2.5	0%	
			5.0	0%	
Mysidopsis bahia	6/9/90	6/13/90	0.0	100%	12.0 ppm
			1.3	100%	
			2.5	100%	
			5.0	70%	
			10.0	80%	
			25.0	0%	
Menidia ~~menidia~~ beryllina jo 4/1/91	7/3/90	7/7/90	0.0	95%	1.5 ppm
			0.6	95%	
			1.3	85%	
			2.5	0%	
			5.0	0%	

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Organism: Artemia, M. bahia, M. bahia/Mysid

Phase: Standard Ref. Toxic. Sodium Dodecyl Su

Applicant: Port Authority of NY&NJ PN/PE – Reach B



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4/2/91

Organism: Mysidopsis bahia Phase: Sodium dodecyl sulf Stand. Ref Toxicant

Applicant: Port Authority of NY&NJ PN/P5 — Reach B

% SURVIVAL

99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

% CONCENTRATION of toxicant

90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 25 ppm 20 10

0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

LC50 Mysidopsis = 12 ppm

APPLICANT: PA & NJ
Port Ch 2 Alt No.
Reach B

SECTION 404b EVALUATION

A) Elutriate Test Evaluation:

1. Mixing Zone Calculation (based on M.P. D-76-17)

Current Velocity: 0.7 Knots $\left(\frac{1.654 \text{ fps}}{\text{Knot}}\right)(.5) = 0.59$ fps

Rate of Overflow: _____

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (84 ft)
r= radius of source of overflow (84 ft)
λ= turbulent dissapation parameter (0.005)
X= horizontal distance from source
Vw= current velocity
d= depth of channel (42 ft. maintenance depth)

Then $L = \sqrt{\left(\frac{t(\lambda) + 0.149\ R^{.66}}{0.094}\right)^3}$

$A = X\left(\frac{\pi + 2r}{2}\right)$

$X = Vw \cdot t$

Volume of mixing zone (Vm)=

2. Dillution Calculations

% dilution of elutriate (De) = $\frac{\text{no marine standards}^*}{\text{Elutriate conc.} - \text{Ambient conc.}} \times 100$

% dilution of overflow (D) = $\frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$

In order to meet water quality standards, the % dilution of overflow must not exceed the lowest % dilution of the elutriate necessary to reach ambient concentrations.

Chemical Constituent	De
Cd	$\frac{\text{ambient}}{\text{elutriate}} = \frac{0.076 \text{ ppb}}{0.457 \text{ ppb}} = 0.166$ $0.166 \times 100 = 16.6\%$

Comments: NJDEP (Hilary Russell) confirmed that there are no set marine standards. Elutriate conc. here is << freshwater standard (10 ppb Cd). [illegible] NOT exceed 9% dilution elutriate will require less than 1%

PN/PE
Reach B

B) Bioassay Application:

1. Mixing Zone Calculation (based on M.P. D-76-17)

Current Velocity: 0.59 fps
Rate of Overflow*: 8.1 cfs

*On a "worst case" basis rate and duration of overflow equals the volume of liquid that one clamshell will hold per minute for no more than one-half hour. (This applies to barge overflow only)

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (54 ft)
r= radius of source of overflow (54 ft)
λ= turbulent dissapation parameter (0.005)
X= horizontal distance from source
Vw= current velocity
d= depth of channel (42 ft maintenance depth)

Then $L=\sqrt{\left(\frac{t(\lambda) + 0.149\ R^{.66}}{0.094}\right)^3}$

$X = Vw \cdot t$

$A = X\left(\frac{L + 2r}{2}\right)$

Volume of mixing zone (Vm)= A·d

2. Dilution Calculation

Lowest L.P.C. from suspended particulate phase of bioassay: 0.76 for Acartia tonsa

$$\% \text{ dilution (D)} = \frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$$

In order to meet water quality standards, the % dilution must not exceed the lowest L.P.C. for the suspended particulate phase of the bioassay.

at 1 s, $\frac{8.1\ cf}{4067\ cf} \times 100 = 0.20\%$.

% dilution of overflow will not exceed lowest LPC in less than 1 second.

OLH/t
7/1/91

C

Port A - Hasty, NY + NJ / PN & DS (Zone 12 for a)

CCHA 7/24/91

Total surface area of channel: $(4015 + 500 + 685) \times (685 - 150) = 2.942 \times 10^6$ sq ft

t	% dilution		area affected	% of total area
1s	8.10 / 4067	.20	96.83 sq ft	$\frac{96.83}{2.942 \times 10^6} \times 100 = .003\%$
10s	81 / 41,174	.197	980.33 "	
100s	810 / 462,367	.175	11,009 "	
500s	4050 / 3,644,705*	.11	86,780 sq ft	

*overflow has ceased

Based on the elutriate/bioassay testing done, this material will dilute to acceptable levels in << 1 second affecting < 96.83 sq ft or 0.003 % of the total area of the channel.

Comments: Within 1 second the % dilution will be 0.20%, which is less than the lowest LPC for suspended particulate phase

DISPOSITION FORM

Reach C

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
CENANOP-W	Review of Bioassay Data: Port Authority of NY & NJ PN/PG Reach C

TO MEMO FOR THE RECORD FROM C, Water Quality Compliance Branch DATE OLHA/X5624 CMT 1 ~~4/3/91~~ 10/10/91 Jo

1. Enclosed is an interpretive summary of results of three-phased bioassays performed on dredged material composited from 8 sampling sites (shown on inclosed map) located in Newark Bay. Bioassays were run in accordance with "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters", which is the Implementation Manual for Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972. At the time that samples were collected, the 21 Dec 1984 edition of the NYD/EPA Region 2 Guidance Manual was in effect.

2. Bioassays were performed by Enseco, Marblehead, Mass & Cambridge, Mass. Samples were collected on May 1990 and test results were completed on July 1990, and reported in December 1990.

3. All samples consisted of cores to project depth. According to the testing laboratory's report, stratification was observed in sample cores. Grain size analyses indicate the proposed material to average:

6.9 % sand
56.0 % silt
37.1 % clay

4. Analysis of the results for the three phases indicates that the LPC for this material is within acceptable limits as defined in the EPA Ocean Dumping Regulations and the Corps/EPA Implementation Manual, provided defacto capping is performed. *

5. Results of bioaccumulation analyses performed on organisms surviving the solid phase testing are also inclosed. An evaluation of these data indicates that the proposed dredged material does not exhibit an environmentally significant bioaccumulation potential.

Incl
as

Chief, Water Quality Compliance Branch
MONTE GREGES

CAPPING IS REQUIRED
~~4/3/91~~ 10/10/91
OLHA X5624

DA FORM 2406 dec 82 PREVIOUS EDITIONS WILL BE USED

U.S. GOVERNMENT PRINTING OFFICE: 1982-37

BERTH NO.	DATE SOUNDED
56	4-24-89
58	9-11-89
60	9-11-89
62	2-1-90
64	2-6-90
66	2-6-90
68	2-3-90
70	2-3-90
72	2-3-90
74	2-3-90
76	6-20-89
78	8-22-89
80	10-10-89
82	6-17-89
86	6-23-89
88	6-19-89
90	1-31-90
92	1-31-90
94	10-3-89
96	10-3-89

BERTH NO.	SOUNDED
98	10-3-89

Reach C
PIPE

n = 5 sample sites

Sect #'s
37
39
41
43
45 Top/Bottom
47
50
54

OUTFALL

IN FEET AND
W/DREDGING
OF 40 FEET
PLUS 2 FEET

TWIN SPRING

: SAMPLE & ARCHIVE

: SAMPLE & ANALYZE FOR 2,3,7,8-TCDD

: SAMPLE, DIVIDE INTO TOP & BOTTOM HALF & ANALYZE EACH HALF FOR 2,3,7,8-TCDD

Samples analyzed in EPA Region II Laboratory
O'Connor
Chief, Ops. Div.
29 Mar 1990

PLAN
500 1000
SCALE IN FEET

Jun 89

ELIZABETH CHANNEL

PORT NEWARK

PIERHEAD CHANNEL

Applicant: PN/PE - Retel

Table 1. BIOASSAY RESULTS

	LC_{50} or EC_{50} (critical)	LPC after 4 hours	DILUTION after 4 hours
LIQUID PHASE (96-hour test)			
Skeletomena costatum			
Mysidopsis bahia			
Menidia ~~menidia~~			
SUSPENDED PHASE (96-hour test)			
Acartia tonsa	>100 %	>1 %	.0043 %
Mysidopsis bahia	>100 %	>1 %	↓
Menidia ~~menidia~~	>100 %	>1 %	

LC_{50} - Lethal Concentration resulting in 50% mortality
EC_{50} - Effective Concentration resulting in 50% inhibition (applies to phytoplankton)
LPC - Limiting Permissible Concentration (0.01 times critical EC_{50} or LC_{50})

	% SURVIVAL			COMPARISON OF REFERENCE & TEST SEDIM								
	Control	Reference	Test	$\bar{d} = \lvert\bar{X}_R - \bar{X}_T\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2+S_T^2}{n}}$	calculated $F = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	k	$\nu = k(n-1)$	Table F	I. S s
	$\bar{X}$ S	$\bar{X}_R$ S_R	$\bar{X}_T$ S_T								
SOLID PHASE (10-day test)											
Paleomonetes	94.0 (2.65)	93.5 (4.32)	88.20 (11.05)	5.6	5.31	1.11	5	2	8	5.32	
	100.0 (0.00)	100.0 (0.00)	100.0 (0.00)	0.0	0.00	——	5	2	8	5.	
Mercenaria mercenaria	98.33 (2.89)	92.0 (5.70)	78.0 (12.55)	14.0	6.16	5.17	5	2	8	5.32	
Nereis virens											
Total Community	97.44 (3.32)	95.27 (5.22)	88.73 (12.90)	6.54	6.22	1.11	15	2	28	4.19	

organisms/species/replicates 60, 120, or 150 shrimp, 20 worms & 20 clams
replicates Ref, Test = 5 reps; Contr = 3 reps
Total # organisms/test

* - significant at 95% confidence level
SD_c - standard deviation of control
SD_t - standard deviation of test sediment
SD_d - standard deviation of difference between means
D.F. - degrees of freedom
SD_r - standard deviation of reference sediment

Table 3. SUSPENDED PARTICULATE PHASE [illegible]

Applicant: D + Authority of NY & NJ / PA, DE - Reed C.

Acartia tonsa (copepod)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC_{50}
4 hr	100	100	100	100	>100
8 hr	100	100	100	100	>100
24 hr	98	98	98	100	>100
48 hr	93	95	85	93	>100
72 hr	93	93	85	90	>100
96 hr	93	92	85	88	>100

(# organisms/test)

Mysidopsis bahia (mysid shrimp)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC50
4 hr	100	100	100	100	>100
8 hr	100	100	100	100	>100
24 hr	100	100	100	100	>100
48 hr	100	100	98	100	>100
72 hr	100	100	95	98	>100
96 hr	98	98	93	93	>100

(#organisms/test)

Menidia ~~menidia~~ beryllina (fish)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC50
4 hr	100	100	100	100	>100
8 hr		100			>100
24 hr		100			>100
48 hr		100			>100
72 hr		100			>100
96 hr	↓	98	↓	↓	>100

(#organisms/test)

LC_{50} - Lethal Concentration resulting in 50% mortality

Table 4. Dilution Evaluation Based on the Tetra Tech Model

Applicant: Port Authority of NY & NJ
PN/PE – Reach C

The dilution of the proposed dredged material has been evaluated by use of the Tetra Tech computer model. A description of the model has been published as Technical Report D-78-47 of the Corps' Dredged Material Research Program, and is entitled Evaluation and Calibration of the Tetra Tech Dredged Material Disposal Models Based on Field Data. The New York District requested that a study be conducted which would give example dilutions resulting from typical disposal operations and dredged materials found in the New York District. This study has been completed and is entitled Discussion of Dredged Material Disposal Models and Their Application for the New York District.

This evaluation is based on model run number 12, which most closely approximates the project disposal operations and dredged material.

Based on this model run, the dilution of the material at four hours is predicted to be .0043 %.

The model run selected most closely approximates the project material for the parameter of percent moisture content, because this parameter is the most sensitive.

Moisture content is 50.9 %.

CLHA/X562
JO 4/2/91

Table 5. CCUMULATION TEST RESULTS: (10 Day Laboratory

Applicant: Port Authority of NY & NJ
PN/PE - Reach C

			n=5 $\bar{x}$	S	$\bar{d} = \lvert \bar{x}_{Ref} - \bar{x}_{Test} \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{Ref}^2 + S_{Test}^2}{n}}$	calculated "F" $= \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	F(0.05)	C.V. = $\frac{S}{\bar{x}}$ Ref & Test (5 reps)	C.V. = $\frac{S}{\bar{x}}$ Sub-samples (3 reps)	Is diff. significant at 95% confidence level
Pet Hydro 0.10ppm	Palaemonetes Pugio	Ref	5.19	3.22	3.84	2.20	3.04	5.318			NO
		Test	9.03	3.73							***
	Mercenaria mercenaria	Ref	11.22	7.58	6.92	3.43	4.07	5.318			NO
		Test	18.14	1.12							***
	Nereis virens	Ref	5.29	3.72	8.72	4.53	3.71	5.318			!
		Test	17.01	9.41							***
PCB * 0.04ppm	Palaemonetes Pugio	Ref	0.02	0	0.0	0	—	5.318			NO
		Test	0.02	0							***
	Mercenaria mercenaria	Ref	0.02	0	0.01	0.005	4.0	5.318			NO
		Test	0.03	0.011							***
	Nereis virens	Ref	0.05	.013	0.04	0.031	1.66	5.318			NO
		Test	0.09	0.068							***
Hg 0.20ppm	Palaemonetes Pugio	Ref	<0.20	**							***
		Test	<0.20	**							***
	Mercenaria mercenaria	Ref	<0.20	**							***
		Test	<0.20	**							***
	Nereis virens	Ref	<0.20	**							***
		Test	<0.20	**							***
Cd 0.25ppm	Palaemonetes Pugio	Ref	<0.25	**							***
		Test	<0.25	**							***
	Mercenaria mercenaria	Ref	<0.25	**							***
		Test	<0.25	**							***
	Nereis virens	Ref	<0.25	**							***
		Test	<0.25	**							***

* <0.04 mg/Kg for PCB detection will be calculated as 0.02 mg/Kg for statistical purposes. 4/2/91

*Statistically Significant (95% confidence level)

... values, are below detection limits.

able 5. I CUMULATION TEST RESULTS. (10 Day Laboratory T

Applicant: E. cliff

			n= 5								
			$\bar{x}$	S	$\bar{d} = \lvert\bar{x}_{Ref} - \bar{x}_{test}\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{Ref}^2 + S_{Test}^2}{n}}$	Calculated "F" $= \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	C.V. $= \frac{S}{\bar{x}}$ Ref. & Test (5 reps)	C.V. $= \frac{S}{\bar{x}}$ Sub-samples (3 reps)	Stat. Signif. % Recovery
DDT 0.02 ppm	Palaemonetes	Ref	<0.02	NV	Ø	—	—			***
		Test	<0.02	NV						NO
	Mercenaria	Ref	<0.02	NV	Ø	—	—			***
		Test	<0.02	NV						NO
	Nereis	Ref	<0.02	NV	Ø	—	—			***
		Test	<0.02	NV						*
DDT 0.02 ppm	Menida menida	Ref								***
		Test								
	Mercenaria	Ref								***
		Test								
	Nereis	Ref								***
		Test								
	Palaemonetes	Ref								***
		Test								***
	Mercenaria	Ref								***
		Test								*
	Nereis	Ref								***
		Test								***
	Palaemonetes	Ref								***
		Test								***
	Mercenaria	Ref								***
		Test								***
	Nereis	Ref								***
		Test								

*Statistically Significant (95% confidence level)

0 = values are below detection limits.

SJD 4/10/91

Table 6. ELUTRIATE TEST RESULTS (10 Day Laboratory Tests)

Applicant: Port Authority of NY & NJ
PN/PE ~ Reach C

CHEMICAL CONSTITUENT	SITE WATER (S.D.)	ELUTRIATE (S.D.)	$\bar{d}$ DIFFERENCE Site Water S.D. − Elutriate S.D.	$S_{\bar{d}}$	"F" Statistic $\left(\frac{\bar{d}}{SD_{\bar{d}}}\right)^2$	DF	Tabular "F" value	Is d Statist Signif Confide
Petroleum Hydrocarb.	< 2.0	< 2.0	0	0	———	4	7.71	NC
PCB's	< 0.1	< 0.1	0	—				NO
Hg	< 0.1 (0)	< 0.1 (0)	0	0	———	4	7.71	NC
Cd	0.047 - (.0091)	0.413 (.0833)	0.366	0.0484	57.2	4	7.71	YE
DDT	< 0.005	< 0.005	0	—				NC

$$SDd = \sqrt{\frac{SDs^2 + SDe^2}{n}}$$

Values are in µg/l (ppb)

DF= Degrees of freedom
2(n-1)

JP 4/2/91
4/10/91

TABLE 7. BULK SEDIMENT ANALYSIS

Applicant: Port Authority of NY & NJ
PN/PE – Reach C

n= 8	$\bar{x}$	S.D.	units
Cu	223.1	46.74	ppm
Ni	47.8	9.21	ppm
Zn	467.8	174.05	ppm
% Moisture	50.9	6.3	%
Total organic C (loss on ignition)	35,524	15,583	mg/kg

JR 4/10/91

TABLE 8. STANDARD TOXICANT ANALYSIS (96-Hr test)

Applicant: Port Authority of NY & NJ
PN/PE ~ Reach C

Toxicant (Brand & grade): Sodium dodecyl sulfate

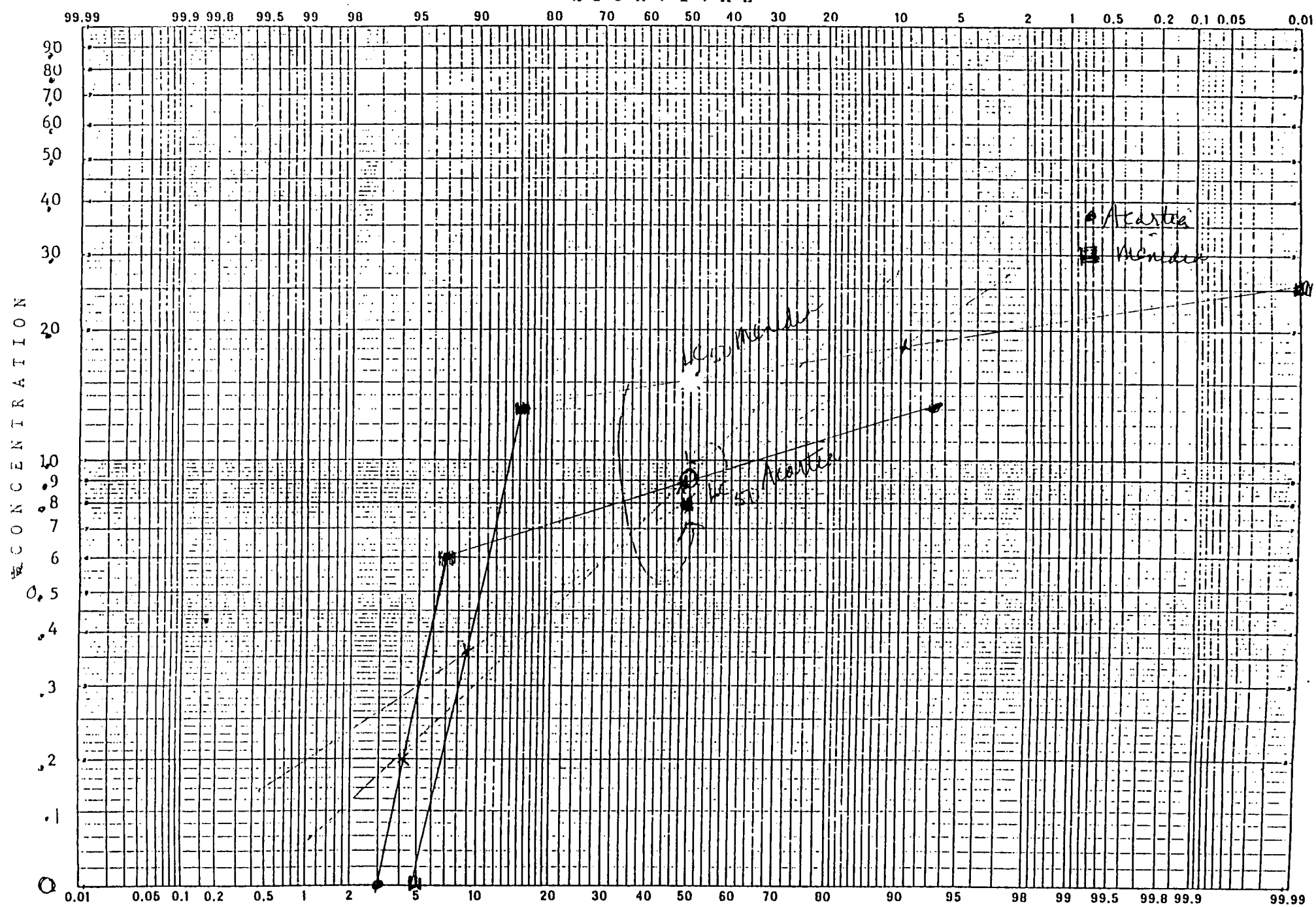
Artificial Seawater Mix: _____

ORGANISM	TEST START DATE	TEST FINISH DATE	TOXICANT CONC (mg/l)	% SURV ~~or % RESP~~	96-HR EC50/LC50 (mg/l)
Skeletonema costatum					
Acartia tonsa	6/8/90	6/12/90	0.0	97	0.9 ppm
			0.6	93	
			1.3	07	
			2.5	0	
			3.0	0	
Mysidopsis bahia	6/9/90	6/13/90	0.0	100	9.1 ppm
			1.3	100	
			2.5	100	
			5.0	70	
			10.0	80	
			25.0	0	
Menidia beryllina	7/3/90	7/7/90	0.0	95	0.8 ppm
			0.6	95	
			1.3	85	
			2.5	0	
			5.0	0	

Acartia tonsa — see next p.

Organis: Mysidopsis bahia / Menidia beryllina Phase: Standard Ref. Toxicn

Applicant: Port Authority of NY & NJ / PN/PE ~ Reach C



NO. 3128. LOGARITHMIC PROBABILITY. DESIGNED BY HAZEN, WHIPPLE & FULLER.

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Organism: Mysidopsis bahia Phase: Stnd. Ref. Tox

Applicant: Port Authority of NY&NJ PN/PS - Reach C

% SURVIVAL

99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05

CONCENTRATION

90 80 70 60 50 40 30 25 20 10 9 8 7 6 5 4 3 2.5 2 1

0.01 0.05 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 99.99

Mysidopsis

PA-87-NJ
DN/DE

SECTION 404b EVALUATION

Reach C

A) Elutriate Test Evaluation:

1. Mixing Zone Calculation (based on H.P. D-76-17)

Current Velocity: 0.7 knots $\left(\frac{1.659 \text{ fps}}{\text{knot}}\right)(.5) = 0.59$ fps

Rate of Overflow: _____

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (84 ft)
r= radius of source of overflow (84 ft)
λ= turbulent dissapation parameter (0.005)
X= horizontal distance from source
Vw= current velocity
d= depth of channel (42 ft maintenance depth)

Then $L = \sqrt{\left(\frac{t(\lambda) + 0.149\ R^{.66}}{0.094}\right)^3}$

$A = X\left(\frac{L + 2r}{2}\right)$

Volume of mixing zone (Vm)=

$X = Vw \cdot t$

2. Dillution Calculations

% dilution of elutriate (De) = $\frac{\text{Standard conc.} - \text{Ambient conc.}}{\text{Elutriate conc.} - \text{Standard conc.}} \times 100$

% dilution of overflow (D) = $\frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$

In order to meet water quality standards, the % dilution of overflow must not exceed the lowest % dilution of the elutriate necessary to reach ambient concentrations.

Chemical Constituent	De
Cd	$\frac{\text{ambient}}{\text{elutrate}} \times 100 = \frac{.047 \text{ ppb}}{.413 \text{ ppb}} \times 100 = 11.4\%$

Comments: Within 1 second, the 9o dilution of overflow will NOT exceed 9o dilution of elutriate.

OLHA
7/2/97

PNDE
Reach C

B) Bioassay Application:

1. Mixing Zone Calculation (based on M.P. D-76-17)

Current Velocity: 0.59 fps
Rate of Overflow*: 5.1 cfs

*On a "worst case" basis rate and duration of overflow equals the volume of liquid that one clamshell will hold per minute for no more than one-half hour. (This applies to barge overflow only)

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (84 ft)
r= radius of source of overflow (84 ft)
λ= turbulent dissapation parameter (0.001)
X= horizontal distance from source
Vw= current velocity
d= depth of channel (42 ft maintenance depth)

Then $L=\sqrt{\left(\frac{t(\lambda) + 0.149\ R^{.66}}{0.094}\right)^3}$

$X = Vw \cdot t$

$A = X\left(\frac{L + 2r}{2}\right)$

Volume of mixing zone (Vm)= A·d

t	A_m	V_m
1 s	96.83×42 = 4067	cf
10 s	980.33×42 = 41,174	
100 s	11,009×42 = 462,367	

2. Dilution Calculation

Lowest L.P.C. from suspended particulate phase of bioassay: 1% for all species tested.

$$\% \text{ dilution (D)} = \frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$$

In order to meet water quality standards, the % dilution must not exceed the lowest L.P.C. for the suspended particulate phase of the bioassay.

At 1 second, the % dilution of overflow = 0.20%, which is less than lowest LPC for susp. partic. phase for all species tested.

1C

Reach C

Total surface area of channel: 5300' x 500' = 2.65×10^6 sq ft
(Elizabeth Channel)

ULHA
7/2/91

t	% dilution	area affected	% of total area
1	0.20	96.83 sq ft	.004 %
10	0.197	980.33 "	
100	0.175	11,009 "	
500	0.11	56,750 "	

*overflow has ceased

Based on the elutriate/bioassay testing done, this material will dilute to acceptable levels in < 1 second affecting < 96.83 sq ft or .004 % of the total area of the channel.

Comments:

DISPOSITION FORM

Reach D

For use of this form, see AR 340-15; the proponent agency is TAGO.

REFERENCE OR OFFICE SYMBOL	SUBJECT
CENANOP-W	Review of Bioassay Data: PORT AUTHORITY OF NY & NJ PORT NEWARK / PORT ELIZABETH REACH D

TO MEMO FOR THE RECORD

FROM C, Water Quality Compliance Branch

DATE ~~7/2/91~~ 10/10/91 CMT 1

OLHA x5021

1. Enclosed is an interpretive summary of results of three-phased bioassays performed on dredged material composited from 5 sampling sites (shown on inclosed map) located at Newark Bay (Channel). Bioassays were run in accordance with "Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters", which is the Implementation Manual for Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972. At the time that samples were collected, the 21 Dec 1984 edition of the NYD/EPA Region 2 Guidance Manual was in effect.

2. Bioassays were performed by ENSECO Labs (Marblehead & Cambridge, Mass). Samples were collected between 5/16 - 5/31/90 and test results were completed on July 1990 and reported in December 1990.

3. All samples consisted of cores to project depth. According to the testing laboratory's report, stratification was observed in sample cores. Grain size analyses indicate the proposed material to average:

9.2 % sand
57.8 % silt
32.0 % clay

4. Analysis of the results for the three phases indicates that the LPC for this ...ial is within acceptable limits as defined in the EPA Ocean Dumping Regulations ... the Corps/EPA Implementation Manual, provided de facto capping is performed. 10/10/91

5. Results of bioaccumulation analyses performed on organisms surviving the solid phase testing are also inclosed. An evaluation of these data indicates that the proposed dredged material does not exhibit an environmentally significant bioaccumulation potential.

Incl
as

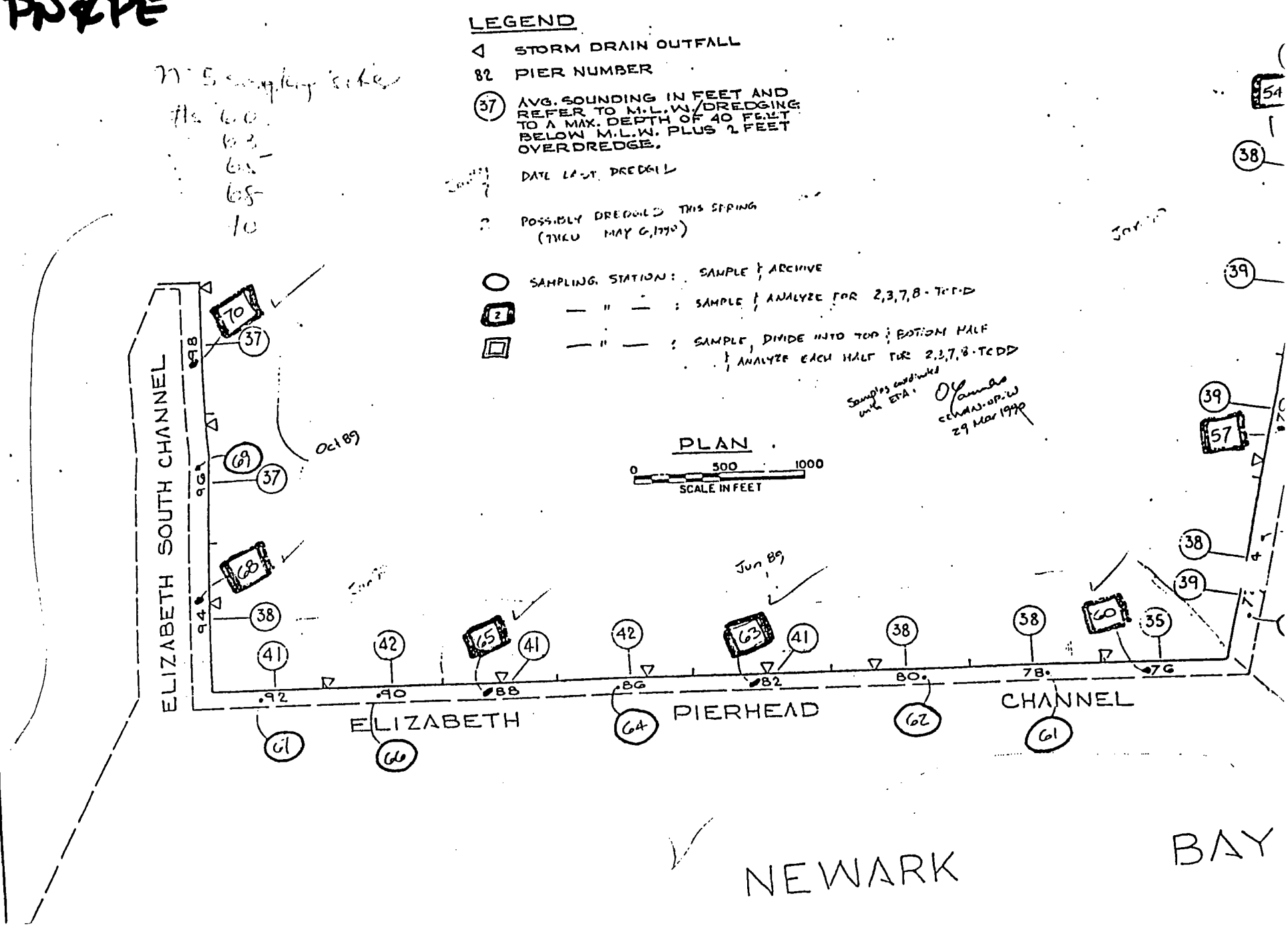
MONTE GREELEY
Chief, Water Quality Compliance Branch

de facto CAPPING is required

JD 10/10/91

Rich D

PURPE


LEGEND
STORM DRAIN OUTFALL
82 PIER NUMBER
(37) AVG. SOUNDING IN FEET AND REFER TO M.L.W./DREDGING TO A MAX. DEPTH OF 40 FEET BELOW M.L.W. PLUS 2 FEET OVERDREDGE.
DATE LAST DREDGED
? POSSIBLY DREDGED THIS SPRING (THRU MAY 6, 1990)
SAMPLING STATION: SAMPLE & ARCHIVE
— " — : SAMPLE & ANALYZE FOR 2,3,7,8-TCDD
— " — : SAMPLE, DIVIDE INTO TOP & BOTTOM HALF & ANALYZE EACH HALF FOR 2,3,7,8-TCDD
PLAN
0 500 1000
SCALE IN FEET
ELIZABETH SOUTH CHANNEL
ELIZABETH PIERHEAD
CHANNEL
NEWARK BAY
Oct 89
Jun 89
Jun 89
Samples analyzed upon ETA: O'Connor Schutz Dev. Co. 29 Mar 1990

Applicant: PSN / PG - Reed 1

Table 1. BIOASSAY RESULTS

	LC_{50} or EC_{50} (critical)	LPC after 4 hours	DILUTION after 4 hours
LIQUID PHASE (96-hour test)			
Skeletomena costatum			
Mysidopsis bahia			.0043
Menidia ~~menidia~~ beryllina			
SUSPENDED PHASE (96-hour test)			
Acartia tonsa	>100%	>1%	
Mysidopsis bahia	>100%	>1%	
Menidia ~~menidia~~ beryllina	>100%	>1%	

LC_{50} - Lethal Concentration resulting in 50% mortality
EC_{50} - Effective Concentration resulting in 50% inhibition (applies to phytoplankton)
LPC - Limiting Permissible Concentration (0.01 times critical EC_{50} or LC_{50})

	% SURVIVAL			COMPARISON OF REFERENCE & TEST SEDIMEN							
	Control $\bar{X}$ S	Reference $\bar{X}_R$ S_R	Test $\bar{X}_T$ S_T	$\bar{d} = \lvert\bar{X}_R - \bar{X}_T\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2 + S_T^2}{n}}$	calculated $f = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	K	$\nu = K(n-1)$	Table F	Is d.f. Statistically signif.*
SOLID PHASE (10-day test)											
Paleomonetes	94.0 (2.65)	93.8 (4.32)	92.6 (5.32)	1.2	3.06	0.15	5	2	8	5.32	NO
Mercenaria mercenaria	100.0 (0.00)	100.0 (0.00)	99.0 (2.24)	1.0	1.00	1.00	5	2	8	5.32	NO
Nereis virens	98.33 (2.89)	92.0 (5.70)	90.0 (3.54)	2.0	3.00	0.44	5	2	8	5.32	NO
Total Community	97.44 (3.32)	95.27 (5.22)	93.87 (5.33)	1.40	1.93	0.53	15	2	28	4.19	NO

organisms/species/replicates

replicates

Total # organisms/test

* - significant at 95% confidence level
SD_c - standard deviation of control
SD_t - standard deviation of test sediment
SD_d - standard deviation of difference between means
D.F. - degrees of freedom
SD_r - standard deviation of reference sediment

Table 3. SUSPENDED PARTICULATE PHASE BIOASSAY RESULTS (96 hr test)

Applicant: Port Authority of NY & NJ
PN/DE ~ Reach D

Acartia tonsa
(copepod)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC_{50}
4 hr	100	100	100	100	>100%
8 hr	100	100	100	100	>100
24 hr	98	100	100	100	>100
48 hr	98	100	100	100	>100
72 hr	92	95	98	83	>100
96 hr	92	95	95	78	>100

(# organisms/test)

Mysidopsis bahia
(mysid shrimp)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC50
4 hr	100%	100%	100	100	>100%
8 hr	↓	↓	↓	↓	↓
24 hr	↓	↓	↓	↓	↓
48 hr	↓	↓	↓	↓	↓
72 hr	↓	↓	↓	↓	↓
96 hr	↓	↓	↓	↓	↓

(#organisms/test)

Menidia ~~menidia~~ beryllina
(fish)

	% Survival Test Concentrations				
	Control	10%	50%	100%	LC50
4 hr	100%	100	100	100	>100%
8 hr	↓	100	100	100	↓
24 hr	↓	100	100	100	↓
48 hr	↓	100	98	100	↓
72 hr	↓	100	97	100	↓
96 hr	↓	98	85	95	↓

(#organisms/test)

LC_{50} - Lethal Concentration resulting in 50% mortality

Table 4. Dilution Evaluation Based on the Tetra Tech Model

Applicant: Port Authority of NY & NJ
PN/PE - Reach D

The dilution of the proposed dredged material has been evaluated by use of the Tetra Tech computer model. A description of the model has been published as Technical Report D-78-47 of the Corps' Dredged Material Research Program, and is entitled Evaluation and Calibration of the Tetra Tech Dredged Material Disposal Models Based on Field Data. The New York District requested that a study be conducted which would give example dilutions resulting from typical disposal operations and dredged materials found in the New York District. This study has been completed and is entitled Discussion of Dredged Material Disposal Models and Their Application for the New York District.

This evaluation is based on model run number 12, which most closely approximates the project disposal operations and dredged material.

Based on this model run, the dilution of the material at four hours is predicted to be 0.0043 %.

The model run selected most closely approximates the project material for the parameter of percent moisture content, because this parameter is the most sensitive.

Moisture content is 50.8 %.

Table 5. CUMULATION TEST RESULTS (10 Day Laboratory T

Applicant: Port Authority of NY & NJ
PN/PE - Berth D

			n=5 $\bar{x}$	S	$\bar{d} = \lvert \bar{x}_{ref} - \bar{x}_{test} \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{ref}^2 + S_{test}^2}{n}}$	calculated "F" $= \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	Table F	C.V. $= \frac{S}{\bar{x}}$ Ref. & Test (Srepp.)	Sub-samples (3 rep)	Is difference statistically significant at 95% conf.?
Pet Hydro	Palaemonetes Pugio	Ref	5.19	3.22	40.21	13.67	8.65	5.318			***
		Test	45.40	30.39							YES
0.10ppm	Mercenaria mercenaria	Ref	11.22	7.58	0.13	4.76	.0007				***
		Test	11.35	7.47							NO
	Nereis Virens	Ref	5.29	3.72	6.28	3.94	2.54				***
		Test	14.57	7.98							NO
PCB	Palaemonetes Pugio	Ref	0.02	0	0.0	.001	—				***
		Test	0.02	0.003							NO
0.04ppm	Mercenaria mercenaria	Ref	0.02	0	0.0	0.—	—				***
		Test	0.02	0 —							NO
	Nereis Virens	Ref	0.05	.012	0.0	0.015	—				***
		Test	0.05	0.03							NO
Hg	Palaemonetes Pugio	Ref	<0.20	* *	0	—					***
		Test	<0.20	* *							NO
0.20ppm	Mercenaria mercenaria	Ref	<0.20	* *	0						***
		Test	<0.20	* *							NO
	Nereis Virens	Ref	<0.20	* *	0						***
		Test	<0.20	* *							NO
Cd	Palaemonetes Pugio	Ref	<0.25	* *	0	—					***
		Test	<0.25	* *							NO
0.25ppm	Mercenaria mercenaria	Ref	<0.25	* *	0						***
		Test	<0.25	* *							NO
	Nereis Virens	Ref	<0.25	* *	0						***
		Test	<0.25	* *							NO

*Statistically Significant (95% confidence level)

Below Method Detection Limits

Table 5. 1 CUMULATION TEST RESULTS. (10 Day Laboratory T

Applicant: Port Authority of NY & NJ

PN/PET ~ Redox D

			n=	$\bar{x}$	S	$\bar{d} = \lvert\bar{x}_{ref} - \bar{x}_{test}\rvert$	$S_{\bar{d}} = \sqrt{\frac{S_{ref}^2 + S_{test}^2}{n}}$	calculated "F" $= \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	C.V. $= \frac{S}{\bar{x}}$ Ref. & Test (5 reps.)	C.V. $= \frac{S}{\bar{x}}$ Sub-samples (3 reps.)	Is diff statistically significant at 95% confidence level
DDT 0.02 ppm	Palaemonetes Pugio	Ref		< 0.02	*	0	—				***
		Test		< 0.02	*						NO
	Mercenaria mercenaria	Ref		< 0.02	*	0	—				***
		Test		< 0.02	*						NO
	Nereis Virens	Ref		< 0.02	*	0	—				***
		Test		< 0.02	*						NO
DDT 0.02 ppm	Menidia menidia	Ref									***
		Test									
	Mercenaria	Ref									***
		Test									
	Nereis	Ref									***
		Test									
	Palaemonetes	Ref									***
		Test									***
	Mercenaria	Ref									***
		Test									**
	Nereis	Ref									***
		Test									***
	Palaemonetes	Ref									***
		Test									***
	Mercenaria	Ref									***
		Test									***
	Nereis	Ref									***
		Test									

*Statistically Significant (95% confidence level)

ULTIA / XSlw2-1
JD 4/14

Table 6. ELUTRIATE TEST RESULTS (10 Day Laboratory Tests) n = 3

Applicant: PORT AUTHORITY OF NY & NJ
PN/PE - Rock D

CHEMICAL CONSTITUENT	SITE WATER (S.D.)	ELUTRIATE (S.D.)	$\bar{d}$ DIFFERENCE | Site Water Elutriate	$S_{\bar{d}}$	"F" Statistic $\left(\frac{\bar{d}}{SD_{\bar{d}}}\right)^2$	Table "F" statistic	DF	Is diff. stat signif. at 95% confidence level
Petroleum Hydrocarb.	< 2.0	< 2.0	0	—	—	7.71	4	NO
PCB's	< 0.1	< 0.1	0	—				NO
Hg	.05 ppb (0)	0.08 (.052)	0.03	.023	1.66	7.71	4	NO
Cd	0.10 (.00874)	0.63 (.182)	.53	.105	25.5	7.71	4	YES
DDT	< 0.05	< 0.05	0	—				NO

Values are in µg/l (ppb)

$$SDd = \sqrt{\frac{SDs^2 + SDe^2}{n}}$$

DF= Degrees of freedom
2(n-1)

TABLE 7. BULK SEDIMENT ANALYSIS

Applicant: Port Authority of NY & NJ
PN/DE ~ Permit D

n= 5	$\bar{x}$	S.D.	units (mg/Kg)
Cu	104.8	28.6	ppm
Ni	23.3	1.6	ppm
Zn	234.0	109.3	ppm
% Moisture	50.78	9.05	%
Total organic C (loss on ignition)	22,600	10,317	ppm (mg/Kg)

NO. 3126. LOGARITHMIC PROBABILITY. DESIGNED BY HAZEN, WHIPPLE & FI...

codex GRAPH PAPER

PRINTED IN U.S.A.

Organism: Acartia tonsa, Menidia beryllina Phase: Embryo-Larval

Applicant: Port Authority of NY & NJ
EN/PE-Reed D

% SURVIVAL

99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

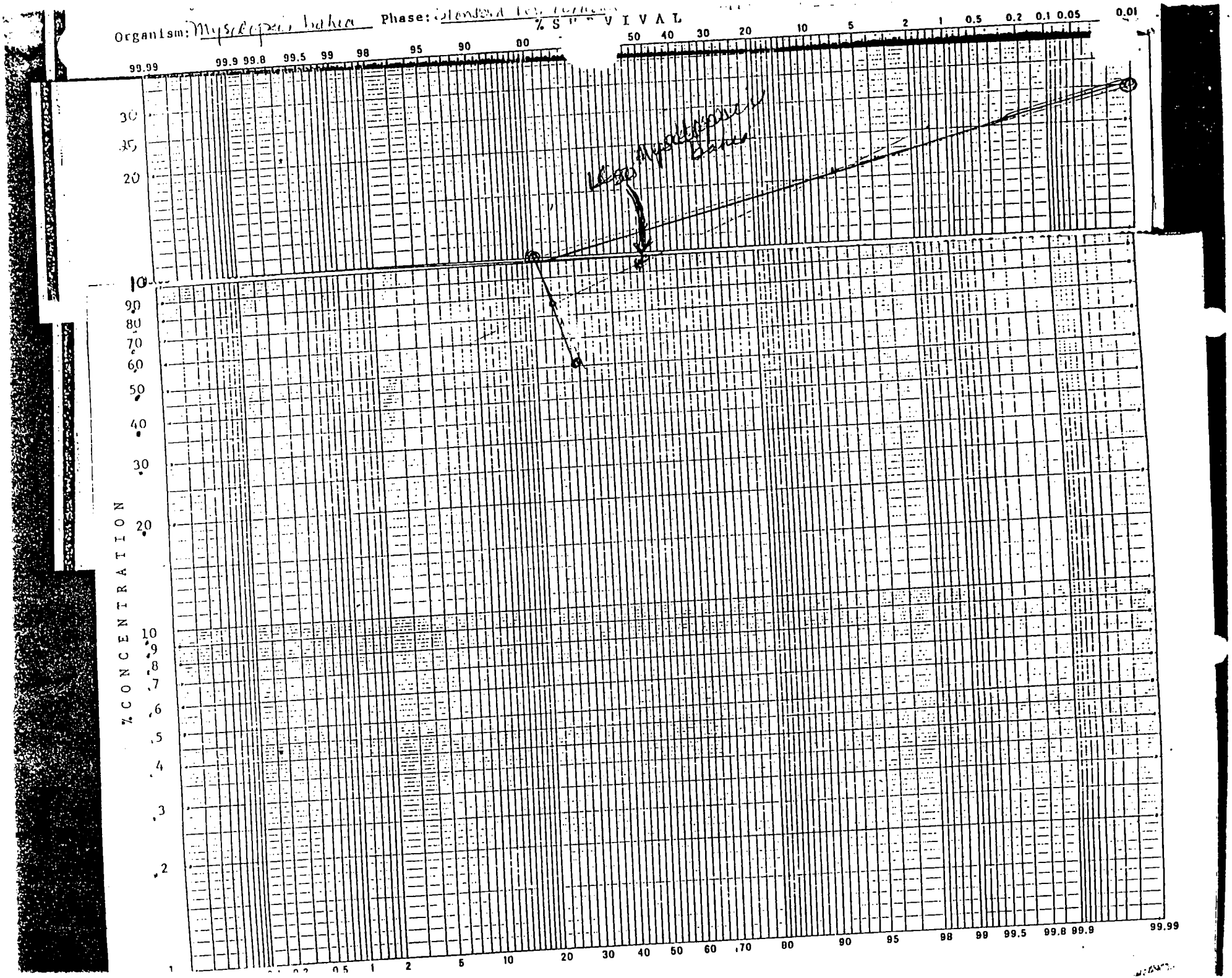
% CONCENTRATION ppm

90 80 70 60 50 40 30 20 10 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2

LC50 Nauplii - 96 hr

LC50 Adult - 96 hr

1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.5 99.8 99.9 9


Organism: Mysidopsis bahia
% SURVIVAL
99.99 99.9 99.8 99.5 99 98 95 90 80
50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
LC50 Mysidopsis Bahia
% CONCENTRATION
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
99.99 99.9 99.8 99.5 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2

OLHA/KS221
JC 4/11/91

TABLE 8. STANDARD TOXICANT ANALYSIS (96-Hr test)

Applicant: Port Authority of NY & NJ
PN/PE - Remed D

Toxicant (Brand & grade): Sodium dodecyl sulfate

Artificial Seawater Mix: _____

ORGANISM	TEST START DATE	TEST FINISH DATE	TOXICANT CONC (mg/l)	% SURV ~~or~~ ~~% RESP~~	96-HR EC50/LC50 (mg/l)
Skeletonema costatum					
Acartia tonsa	6/8/90	6/12/90	0	97	0.9
			0.6	93	
			1.3	7	
			2.5	0	
			5.0	0	
Mysidopsis bahia	6/9/90	6/13/90	0	100	9.5
			1.3	100	
			2.5	100	
			5.0	70	
			10.0	50	
			25.0	0	
Menidia beryllina	7/3/90	7/7/90	0	95	1.8
			0.6	95	
			1.3	55	
			2.5	0	
			5.0	0	

PUCANT - Port Arthur Plant
Port Arthur/Newark
Part D

SECTION 404b EVALUATION

A) Elutriate Test Evaluation:

1. Mixing Zone Calculation (based on W.P. D-76-17)

Current Velocity: 0.59 fps
Rate of Overflow: 8.1 cfs

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (54 ft)
r= radius of source of overflow (54 ft)
λ= turbulent dissapation parameter (0.005)
X= horizontal distance from source
V_w= current velocity
d= depth of channel (42 ft maintained depth)

Then $L = \sqrt{\left(\frac{t(\lambda) + 0.149\ R^{.66}}{0.094}\right)^3}$

$A = X\left(\frac{L + 2r}{2}\right)$

$X = V_w \cdot t$

Volume of mixing zone (V_m)=

2. Dillution Calculations

% dilution of elutriate (De) = $\frac{\text{Standard conc.-Ambient conc.}}{\text{Elutriate conc.-Standard conc.}} \times 100$

% dilution of overflow (D) = $\frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$

In order to meet water quality standards, the % dilution of overflow must not exceed the lowest % dilution of the elutriate necessary to reach ambient concentrations.

Chemical Constituent	De
Cd	$\frac{\text{ambient}}{\text{elutrate}} \times 100 = \frac{0.10}{0.63} \times 100 = 15.87\%$

7/11/91

Comments: After 1 second % dilution of overflow will NOT exceed % dilution of elutriate necessary to reach ambient concentrations.

Reach D

B) Bioassay Application:

1. Mixing Zone Calculation (based on M.P. D-76-17)

Current Velocity: 0.59 fps

Rate of Overflow*: 8.1 cfs

*On a "worst case" basis rate and duration of overflow equals the volume of liquid that one clamshell will hold per minute for no more than one-half hour. (This applies to barge overflow only)

If L= front edge of mixing zone
t= time (in seconds)
R= ½ width of source of overflow (84 ft)
r= radius of source of overflow (54 ft)
λ= turbulent dissapation parameter (0.005)
X= horizontal distance from source
Vw= current velocity
d= depth of channel (42 ft maintenance depth)

Then $L=\sqrt{\left(\frac{t\sqrt{\lambda}) + 0.149\ R^{.66}}{0.094}\right)^3}$

$X = Vw \cdot t$

$A = X\left(\frac{L + 2r}{2}\right)$

Volume of mixing zone (Vm)= A·d is $96.83 \times 42 = 4067$ cf

10 s $950.33 \times 42 = 41,174$ cf

10 cs $11,009 \times 42 = 462,367$ cf

2. Dilution Calculation

Lowest L.P.C. from suspended particulate phase of bioassay: >1% for all species tested.

$$\% \text{ dilution (D)} = \frac{\text{Volume of overflow (Vo)}}{\text{Volume of mixing zone (Vm)}} \times 100$$

In order to meet water quality standards, the % dilution must not exceed the lowest L.P.C. for the suspended particulate phase of the bioassay.

within 1 second, the % dilution of overflow will be 0.20%, which is less than the lowest LPC for susp. particl. phase.

1.C

PNIPE Reach D.

Total surface area of channel: $(250' + 5920')(200') = 1.654 \times 10^6$ sq ft.
Elizabeth Pierhead Channel + Elizabeth Dock Channel

7/12/91

t	% dilution	area affected	% of total area
1.5	0.2%	96.83	$\frac{96.83}{1.654 \times 10^6} \times 100 = .006\%$

*overflow has ceased

Based on the elutriate/bioassay testing done, this material will dilute to acceptable levels in < 1 second affecting < 96.83 sq ft or .006 % of the total area of the channel.

Comments: Water quality criteria are met.

Table 1. BIOASSAY RESULTS / 2,3,7,8-Dioxin Bioassay / Bioaccumul.

B-24SSAY

SOLID PHASE (10-day test)

	% SURVIVAL			COMPARISON OF REFERENCE & TEST SEDIMEN								
	Control	Reference	Test	$\bar{d} = \lvert \bar{X}_R - \bar{X}_T \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2 + S_T^2}{n}}$	calculated $F = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	k	$\nu = k(n-1)$	Table F	Is d stat sign
	$\bar{X}$ S	$\bar{X}_R$ S_R	$\bar{X}_T$ S_T								
NEREIS VIRENS	91.67 (2.89)	68.00 (6.71)									
REACH A			83.00 (11.51)	TEST > REF IN ALL CASES							
REACH B			69.00 (17.46)								
REACH C			77.00 (13.04)								
REACH D			83.00 (9.75)								

B-24SSAY-02

			COMPARISON OF REFERENCE & TEST SEDIME							
Control	Reference	Test	$\bar{d} = \lvert \bar{X}_R - \bar{X}_T \rvert$	$S_{\bar{d}} = \sqrt{\frac{S_R^2 + S_T^2}{n}}$	calculated $F = \left(\frac{\bar{d}}{S_{\bar{d}}}\right)^2$	n	k	$\nu = k(n-1)$	Table F	Is sig
$\bar{X}$ S	$\bar{X}_R$ S_R	$\bar{X}_T$ S_T								
NEREIS VIRENS										
Reach A	<1.00 (0)	18.00 (4.06)	17.00	1.82	87.7	5	2	8	5.318	Y
concentration in tissue (ppb) B	<1.00 (0)	9.74 (3.56)	8.74	1.59	30.1	5	2	8		Y
C	<1.00 (0)	10.54 (0.95)	9.54	0.42	504.2	5	2	8		Y
Reach D	<1.00 (0)	4.96 (0.33)	3.96	0.15	720.0	5	2	8		Y

organisms/species/replicates

replicates

Total # organisms/test

* - significant at 95% confidence level

SD_c - standard deviation of control

SD_t - standard deviation of test sediment

SD_d - standard deviation of difference between means

D.F. - degrees of freedom

SD_r - standard deviation of reference sediment