Southern California Bight
2003 Regional Marine Monitoring Survey
(Bight'03)

Field Operations Manual

Prepared by:
Bight'03 Field Sampling & Logistics Committee

Prepared for:
Commission of Southern California Coastal Water Research Project
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SOUTHERN CALIFORNIA BIGHT 2003 REGIONAL MARINE MONITORING SURVEY

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ACKNOWLEDGEMENTS

This document was developed by the Bight'03 Field Sampling and Logistics Committee. Mike Kelly (City of San Diego, Metropolitan Wastewater Department) was Field Logistics Coordinator and lead editor, and Bill Power (County Sanitation Districts of Los Angeles County) was Co-Chair. Other members of the Bight'03 Field Sampling and Logistics Committee who contributed to this effort included M. James Allen, Dario Diehl, and Ananda Ranasinghe (Southern California Coastal Water Research Project), Art Barnett and Doug Diener (MEC Analytical Systems, Inc.), Brian Edwards (United States Geological Survey), Sarah Fangman (Channel Islands National Marine Sanctuary), Scott Johnson and Michael Machuzak (Aquatic Bioassay and Consulting Laboratories), Mike Mengel and George Robertson (Orange County Sanitation District), David E. Montagne (County Sanitation Districts of Los Angeles County) and Tony Phillips and Jim Roney (City of Los Angeles, Environmental Monitoring Division). Additional contributors included Larry Cooper, Ken Schiff and Steve Bay (Southern California Coastal Water Research Project).

I. INTRODUCTION

A. Background

The Southern California Bight Pilot Project (SCBPP) was conducted in 1994 to begin addressing regional monitoring concerns. This project was the largest regional survey of environmental conditions on the mainland shelf in the Southern California Bight (SCB). It capitalized on the interest and cooperation existing in southern California and the resources available in current monitoring programs to develop an integrated and coordinated regional monitoring program that addressed the needs of the participating local, state, and federal agencies, and provided new management information. The SCBPP provided a much needed first Asnapshot@ of the state of the SCB. The SCBPP resulted in consistent regionwide data sets for describing pollution exposure and biological resources within the SCB. Twelve participating agencies sampled 261 sites on the mainland shelf which provided an unprecedented assessment of pollutant exposure, the status of biological resources, species diversity, and the presence of marine debris in the SCB.

Four years later, the next regional survey of the SCB, Bight'98, continued the development of regional scale management information and followed the general plan of the SCBPP. Participation in Bight'98 increased to 64 agencies and the number of sites sampled grew to 416. New indicators, such as a shoreline microbiology component and analysis of biomarkers in fish, were incorporated into the study, and the strata were expanded to include San Diego Bay, Catalina Island, the Channel Islands, and historically sampled reference sites. The following questions were posed and formed the basis of the investigation: 1) What was the extent and magnitude of change in an indicator measured in the SCB?; 2) Was the degree of change similar throughout the SCB, or was it more severe in particular areas?; 3) Were observed changes associated with identifiable sources of pollution, such as municipal wastewater outfalls, rivers, or harbors?; and 4) Were the associations identified similar throughout the SCB?

Bight’03 continues to build on the cooperative interaction developed during the previous surveys. In addition to having more participants involved in the program, new habitats will be surveyed using more parameters and new sampling methods. There are approximately 60 organizations who will be either directly involved with collecting data in the field, or who have contributed resources to the project. The habitats of interest have been expanded this time to include coastal estuaries, the upper continental slope (200-500 m), and the lower slope and inner basin (500-1000 m).

Bight‘03 is organized into three technical components: 1) coastal ecology; 2) shoreline microbiology; and 3) water quality. As with the former studies, the goal of the project is to assess the condition of the bottom environment and the health of the biological resources of the SCB. To accomplish this goal, the project will focus on two primary objectives: 1) estimate the extent and magnitude of ecological change in the SCB; and 2) determine the mass balance of pollutants that currently reside within the SCB.

Unites States Geological Survey (USGS) will conduct the sampling in the lower slope and inner basin areas and they will use standard operating procedures (SOP) developed independently of the Southern California Bight projects. Their SOP documents will be referenced, rather than included in this manual. The microbiology and water quality surveys will be conducted throughout the following year and will supplement the Bight'03 summer field study. These studies will be conducted according to protocols described in appendices produced by the Microbiology and Water Quality working groups.

The Bight'03 coastal ecology field sampling component will be conducted from July through September of 2003. The purpose of this document is to provide detailed instructions on all field sampling methods that will be used to conduct this study.

II. OVERVIEW OF FIELD SURVEY

A. Sampling Period

The index period for the Bight'03 study will extend from July 14 to September 5, 2003.

B. Sampling Design

The Bight'03 study will continue to use a probability-based sampling design developed by EMAP that combines the strengths of systematic and random sampling. This sampling design consists of a grid of tessellated hexagons with a station selected at random within each hexagon. Sampling can be intensified in areas of special interest by decreasing the size of the hexagons, thereby increasing the number of hexagons in an area.

Bight'03 has identified 10 different strata of stations that will be sampled in this survey. These strata are classified as follows: Channel Islands, shallow offshore (5-30 m), mid depth offshore (30-120 m), deep offshore (120-200 m), continental slope (200-500 m), lower slope and inner basin (500-1000 m), small POTW outfalls, large POTW outfalls, marinas, ports/bays/harbors, and estuaries.

C. Indicators of Ecosystem Health

The primary goal of Bight'03 is to provide an assessment of the overall ecosystem condition of the SCB. To accomplish this goal, the following indicators of ecosystem health will be examined:

- Benthic - sediment characteristics, sediment contamination, infaunal assemblages, and sediment toxicity;
- Demersal fish and invertebrate assemblages, gross fish pathology, biomarkers, and bioaccumulation
- Marine debris (including plastic, lumber, vegetation, glass, etc.)

III. DESCRIPTION OF FIELD TEAMS AND ACTIVITIES

A. Personnel

All field sampling will be conducted by personnel knowledgeable in field sampling (e.g., benthic sampling, trawling, etc.). Teams of field personnel will be on each research vessel participating in the sampling effort. These groups will vary in size depending on which organization is doing the field sampling. The main requirements are that the personnel on board the vessel:

- Have a good working experience with the different types of sampling devices;
- Have the knowledge and experience necessary for conducting the field collection and analysis of benthic invertebrates and sediments, and trawl-caught demersal fish and megabenthic invertebrates;
- Are able to troubleshoot problems when they arise.

B. Chain-of-Command

The following chain-of-command is recommended to avoid confusion, identify responsible parties, and ensure that proper sampling protocols and information flow are followed by each organization:

1) The Lead Scientist will be an organization's primary contact regarding all survey and field-related matters;

2) A Boat Captain will not only be responsible for piloting the sampling vessel each day, but will also be the sole authority regarding decisions on whether to cease or continue sampling operations when conditions at sea are judged to be unsafe;

3) The Cruise Leader is a person designated prior to each sampling day who will be responsible for supervising the scientific crew and sampling operations aboard a particular sampling vessel. This person will have the final decision on whether to abandon or sample a station, and will be responsible for assuring the quality of the data. At the end of each sampling day, they will make sure that all field data and samples are delivered to the appropriate processing personnel in a timely manner. Cruise Leaders are not required to be the same person from field day to field day;

4) Significant changes to the established logistical plan that are outside of the jurisdiction of the Lead Scientist will be communicated to either the Field Logistics Coordinator (Mike Kelly), or the Project Manager (Ken Schiff) before any change is implemented. The teams will accept technical direction from no other authority. All changes to the sampling plan that occur during the field surveys must be documented;

5) All technical matters, such as equipment problems, questions regarding station locations, sampling schedules, etc., will be addressed to the Field Logistics Coordinator by the Lead Scientist **AS SOON AS POSSIBLE;**

6) The Lead Scientist of an organization having completed a pre-survey field audit will be informed of any procedural and/or taxonomic deficiencies field operations by the Auditor. The Lead Scientist will be expected to take the appropriate action to correct the situation as soon as possible.

C. Station Assignments

The study area of the Southern California Bight will be divided among the participating organizations according to the level of effort contributed by each. The number of stations to be sampled by each organization is summarized in Table 1. Maps and coordinates of the stations to be sampled by each organization are located in Appendices 1 and 2, respectively.

TABLE 1. Number of stations (by sample type) to be sampled by organizations participating in the Bight'03 study, summer 2003 (excludes totals for estuaries and special studies).

Organization	Benthic Infauna	Sediment chemistry	Sediment toxicity	Fish assemb.	Tissue chemistry
HY	48	48	28	27	4
LA	28	28	7	17	4
OC	29	29	15	25	3
SD	51	51	33	36	5
ABC	49	49	22	53	8
CINMS	36	67	36	36	0
MBC	33	33	28	18	3
MEC	23	23	9	25	4
SV	8	7	1	4	1
VRG	0	0	0	14	3
TOTAL	**305**	**335**	**171**	**255**	**35**

ORGANIZATION CODES

HY	City of Los Angeles, Environmental Monitoring Division
LA	Los Angeles County Sanitation Districts
OC	Orange County Sanitation Districts
SD	City of San Diego Metropolitan Wastewater Department
ABC	Aquatic Bioassay & Consulting (City of Oxnard, L.A. Bays & Harbors)
CINMS	Channel Islands National Marine Sanctuary
MEC	Marine Ecological Consultants (Encina, San Elijo JPA)
MBC	MBC Applied Environmental Sciences
SV	SeaVentures
USGS	United States Geological Survey
VRG	Vantuna Research Group

D. Equipment

All groups or organizations involved in the sampling program will provide their own research vessel, crew, Van Veen grab, otter trawl, and any other equipment necessary to complete the sampling assignment. Characteristics of each vessel and a list of equipment used during the survey are provided in Appendix 5.

Grab Sampler

Each organization will have a minimum of two modified Van Veen grab samplers. Grab specifications are given in Section 8.

Trawl Nets

Each organization will have a sufficient number of 7.6 m (headrope) trawl nets and sets of otter boards (doors) available. Net and door specifications are given in Section 9.

Cellular Phones

Cellular phones are required to facilitate communication between the Cruise Leader on the sampling vessels and land based Bight'03 project personnel. Vessel cellular telephone numbers are listed in Appendix 5.

E. Weekly Communications

Each week a representative from each participating organization will communicate to SCCWRP (ATTENTION: Larry Cooper) a schedule of proposed sampling days during the upcoming week, operations to be conducted, and general areas where sampling is likely to occur. Project QA/QC Auditors can also use this information to schedule when they can conduct field audits for a particular organization. Prior to a QA/QC audit, the auditor will contact a Lead Scientist to verify that their proposed schedule is still in place.

Each organization will also be required to make weekly electronic submissions of the Bight'03 station occupation and event table information (i.e. grab and trawl) at the end of every sampling week. This information will be used to both track the overall progress of the project, and verify that each field team is accurately and completely sampling each station.

F. Important Telephone Numbers

The names and phone numbers of appropriate personnel and emergency services are listed in Section 13 and Appendix 8. If a particular individual cannot be reached at the listed number, the caller should contact SCCWRP, where an attempt will be made to provide an alternate means by which the individual can be reached.

IV. SAFETY

Sample collection at sea is inherently hazardous and this danger is greatly compounded in bad weather. Thus, the safety of the crews and equipment is of paramount importance throughout the project. Each person working on board a vessel during the project should take personal responsibility for their own safety.

Many accidents at sea are preventable. Safety awareness by the Boat Captain and all crew members is the greatest single factor that will reduce accidents at sea. Each field crew should follow all established rules and provisions within their respective organization's safety program. Sampling should be canceled or postponed during hazardous weather conditions. The final decision shall be made by the Boat Captain, who is responsible for the safety of everyone on board. As with any field program, the first priority is the safety of the people on board, followed by the safety of the equipment, and then the recovery of the data.

V. QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

A. Protocol Calibration/Quality Assurance Procedures

The Bight'03 survey will be conducted cooperatively by a number of organizations which routinely monitor the marine environment according to established protocols. It is important to the success of the Bight'03 study that comparable data are collected by each organization. This Field Operations Manual will provide information on how field operations will be conducted to meet this requirement. The Lead Scientists and Boat Captains will be instructed on the field procedures to be followed during the survey and they, in turn, will instruct their field personnel on the proper procedures for the survey.

The Lead Scientist of each organization is responsible for distributing the Bight'03 Field Operations Manual to all field personnel and ensuring that their staff understands and uses the protocols detailed in the manual.

<u>Lead Scientist/Boat Captain Protocol Orientation Meeting</u>

Lead Scientists and Boat Captains of all organizations participating in the survey will be required to attend a protocol calibration meeting, conducted prior to the survey on June 24, 2003. The goals and objectives of the project will be discussed at this meeting, as will the responsibilities of the Bight03 field personnel. Each participant will be provided with a Bight'03 Coastal Ecology Workplan, a Field Operations Manual and will be instructed on field procedures to be used during the survey. The discussion will also include instruction on proper data entry into the field computers and on field data forms. The meeting will emphasize decision making procedures for determining station and/or sample acceptability, and the conditions that must be met before a station is abandoned. Lines of communication within the project and QA/QC activities occurring on the boat during the survey will also be discussed.

<u>Scientific Team Training</u>

The Lead Scientist from each organization will be responsible for ensuring that their field personnel have been trained properly on all field methods and procedures that will be used during the survey. It will be their responsibility to review the Coastal Ecology Workplan and Field Operations Manual with their field crews, and to make sure that each person understands that these procedures must be followed during the survey. Personnel that cannot perform a required operation will not participate in conducting that operation.

<u>Benthic Sampling</u> (See Section 8)

The participation of several different vessels and field sampling teams in Bight'03 requires that uniform procedures be followed in the field to ensure high quality samples and consistent results. All field personnel will be provided with the Bight'03 Field Operations Manual and will be instructed on sampling procedures, application of sample acceptance criteria, sample processing, and the use of field data forms. All participants are expected to understand and properly carry out all steps in the collection, screening, relaxation, and fixation of infaunal samples. They must also understand the techniques related to the subsampling of sediment, and the handling of sediment chemistry and toxicity samples.

Where necessary, pre-survey field audits will be conducted in an attempt to ascertain a particular organization's field sampling capability and their adherence to standard sampling and sample procedures. These audits will be conducted by representatives who have participated in past regional surveys and whose organization has adopted the prescribed field methods as standard operating procedures for routine monitoring. An audit will be completed for organizations that either did not participate in the Bight'98 field effort, or for organizations that did, but have undergone a significant turnover in personnel since that time.

During the field audits, an Auditor will observe the field crews perform the required field sampling procedures and processing, and as necessary, provide corrective instruction. The Auditor may also conduct subsequent audits on benthic sampling procedures for all participants during the Bight'03 survey to ensure that sampling is conducted in a uniform manner and that all required information is recorded by the field crews.

The goal of the Bight'03 survey is to collect grabs at all sites. However, a Measurement Quality Objective (MQO) of 90% has been established for completeness for the collection of the benthic samples. This completeness goal was established to derive the maximum statistical power of the sampling design and was not set at 100% in recognition that some sites will be difficult, if not impossible, to sample with a Van Veen grab. Nevertheless, field crews are expected to strive to collect samples at 100% of the stations.

Trawl Sampling (See Section 9)

Demersal fish and invertebrate assemblage data (species identification, enumeration, biomass, and length) are greatly influenced by the collection methods. Therefore, strict adherence to prescribed sampling protocols is critical. Fish catches are influenced by gear type and deployment, tow duration, and towing speed. All organizations collecting samples in the field must use standard nets and follow standard trawling procedures to ensure that comparable samples are collected. Field personnel will be provided with the Bight'03 Field Operations Manual. The Lead Scientist of each organization must make sure that his or her staff understands and uses the protocols as detailed in the manual.

Several QA/QC activities will help to ensure the quality of the trawl survey data. These include intercalibration cruises, checks of equipment, sample processing, and taxonomic identification. Trawl equipment, deployment, and sample processing protocols will be checked during pre-survey and in-survey visits to each vessel by the QA/QC Auditors. The Auditors will ensure that the methods used are those prescribed in the Field Operations Manual. The QA/QC Auditor will check trawling procedures and equipment to ensure that trawling is conducted in the same manner by each organization and that the appropriate data is recorded on a Field QA/QC Checklist (Appendix 7). The Auditor will check to make sure that the net is rigged properly, that the appropriate data are recorded, that the trawl is deployed and retrieved properly, and that the catch is properly processed. A check will also be made to see that the scales are calibrated at the start of each day, that other pertinent processing equipment are on board, and that processing is conducted according to methods described in the field manual (Appendix 7). The Lead Scientist will be notified of the audit results so that any problems can be corrected prior to sampling.

Pre-survey trawl field audits will be necessary for organizations that either did not participate in Bight'98, or did, and have since undergone a significant turnover in field personnel. The audits will be conducted by an Auditor prior to the survey to assess equipment, vessels, standard protocols, and, if necessary, to instruct the crew on the trawling procedures described in the manual. Audit data will be recorded on a Field QA/QC Checklist (Appendix 7).

Lead Bight'03 fish and invertebrate taxonomists will be designated prior to the sampling period. In addition, each organization will identify lead fish and invertebrate taxonomists that will participate in their part of the survey. These individuals must have the required expertise in field identification of trawl-caught fishes and/or invertebrates of coastal southern California in depths ranging between 5-500 m. They will be responsible for providing accurate identifications of species collected during the survey and will complete/oversee a review of the voucher collections before they are shipped to SCCWRP.

While it is expected that the lead taxonomists of each organization will have a wide range of knowledge of the common caught trawl species, it is not expected that all persons making field identifications will know every species. It is, therefore, very important that guessing be avoided when it comes to finalizing any particular identification. An error made in the identification of an organism may result in an irretrievable error in the database because most of the organisms that are identified in the field are returned to the sea. If no one onboard knows the identity of a specimen, that specimen shall be returned to the laboratory for final identification. Once the final identity of any specimen has been ascertained in the organization's laboratory, that change will be made on either the trawl fish, or the invertebrate species sheets by crossing out the original name (do not erase the original name) and writing the correct name. Conversely, if it has been determined that a species cannot be identified at the organization's laboratory, it should be sent to SCCWRP along with the voucher specimens for identification.

Three QA/QC activities will help to ensure accurate taxonomic identification of fishes and invertebrates by providing training and intercalibration among organizations:

1) Prior to the survey, a list of recommended taxonomic identification aids will be distributed to participating organizations. Lists of trawl-caught fish and invertebrate species for southern California will also be distributed. A reference collection of voucher specimens of species collected during the SCBPP and Bight'98 surveys is available at SCCWRP for individuals wishing to see species likely to be encountered in Bight'03. In addition, it is recommended (but not required) that field taxonomists attend one or more of the pre-survey information transfer meetings given at SCCWRP on the identification of expected trawl species;

2) Taxonomists from every field sampling organization will be required to participate in at least one pre-survey intercalibration cruise to ensure that

identifications of commonly occurring species are standardized.

3) Taxonomists from each organization will also be required to participate in another pre-survey intercalibration exercise meant to assess the probability of taxonomic error in the field. In this exercise, a bucket of fish and a bucket of invertebrates will be passed between all participating organizations prior to the survey. The taxonomists will identify specimens of representative trawl-caught species in each bucket to the lowest taxon possible. A numbered tag will be attached to each organism so that the identifications can be checked against the correct specimens. This exercise will focus on identification errors. Correct identifications or "Return for Further Identification" (FID) are acceptable. FID indicates that the specimen would have been returned to the laboratory (where additional information or expertise can be found) for final identification. Organizations with more than 5% misidentifications (fish and invertebrates combined) will redo the exercise with a different bucket of organisms. If an organization cannot meet this requirement on the second attempt, a qualified taxonomist from another organization must be on board when trawl sampling is conducted.

Measurement Quality Objectives (MQOs) for the trawl fish and invertebrate sampling effort are defined in terms of accuracy, precision, and completeness. Acceptability criteria have been established for trawl sample collections. The goal of the Bight'03 trawl survey is to collect samples at all designated trawl stations to identify all of the organisms correctly, and to obtain accurate counts, measurements, and weights on all species. However, the MQOs will be set at lower values in recognition of the realities of field sampling. Because some stations may occur on rocky bottom, the MQOs for the study completeness objective for trawl sample collection will be 90%. Of the samples collected, 100% will be processed, identified, counted, measured, and weighed. Accuracy expectations for the crew performance are 95% for identification and 90% for counting, lengths, and biomass. The precision objectives are 90% for fish lengths and within 0.2 kg for biomass.

VI. FIELD COMPUTER

A. General Reqiurements

A field computer will be used whenever possible to collect station occupation/visual observation data during the Bight'03 survey. If a field computer cannot be used, all required sampling event information must be recorded on Bight'03 field data sheets and subsequently loaded into Microsoft Excel data files for submission to the Bight'03 Information Manager. Data submission formats and standards are described in the Bight'03 Information Management Plan.

Bight'03 Field Data System Version 2.0

A field data acquisition application has been developed by SCCWRP for use during the Bight'03 survey. This system facilitates the collection of all the required station occupation and field sampling event information (e.g., grab sampling, trawls, and water quality sampling events). This system has been designed to use laptop computers and has an instruction manual for training and reference. Use of the Bight'03 Field Data System is strongly recommended as the system of choice during the survey.

The Field Data System has the following characteristics and features:

- Runs in Windows NT, XP, ME or 98 OS environments;
- Stores data in an MS Access 2000 application (requires Access 2000);
- Receives direct input of data from DGPS through serial port assuring that all samples are associated with accurate location information and eliminating transcription error associated with hand-written entry of these data;
- Provides data entry templates for all sampling event information required by Bight'03 Information Management Plan;
- Employs drop down lists of acceptable values for many entry fields, thereby reducing entry time and assuring accuracy and compliance with Bight'03 data standards;
- Capable of producing fully completed hardcopy Bight'03 field sampling data sheets which can be used for data backup;
- Produces export data files of all sampling event information in Bight'03 compliant Microsoft Excel files suitable for direct submission to the project Information Manager;
- Capable of being used as simple data entry system for information collected at sea on paper field sampling data sheets, or may be used as a primary data collection tool.

VII. SAMPLING LOGISTICS

A. Navigation

Accurate location of sampling sites is crucial to the success of the Bight'03 survey. Station charts and coordinates (latitude and longitude) are located in Appendices 1 through 3. Vessel positioning will be determined by means of a Differential Global Positioning System (DGPS). If, during the course of a field sampling day, the differential signal is interrupted or lost, sampling may continue using standard GPS.

B. Sampling Schedule

The benthic and trawl surveys may begin July 14, 2003. All field work may be completed in the order that each organization sees fit, as long as the survey is completed by September 5, 2003.

All samples will be collected between sunrise and sunset, with the exception of sediment chemistry and sediment toxicity; those samples may be collected anytime throughout the 24 hour period. Otter trawl samples must be collected between one hour after sunrise and one hour before sunset.

C. Station Types

Ten different strata of stations will be sampled during the survey. These strata are classified as follows: Channel Islands, shallow offshore (5-30 m), mid depth offshore (31-120 m), deep offshore (121-200 m), continental slope (201-500 m), lower slope and inner basin (501-1000 m), small POTW outfalls, large POTW outfalls, marinas, ports/bays/harbors and estuaries. The project sampling station/stratum information is listed in Appendix 2. In the event that relocating a station moves the station into a different sampling stratum, the station will still be sampled and the new stratum will be noted in the comments section of the field data sheet.

D. Site Acceptability Criteria

The location of each sampling site will be designated in advance as a set of coordinates (latitude and longitude). Upon arrival at the site, the depth will be determined by fathometer. This will be regarded as the target depth for all subsequent sampling at the site during the survey and will be used for determining site acceptability. While all sites are single points defined by latitude and longitude, occupation within a specified distance (i.e. the radius limit) of the target coordinates will be considered acceptable.
This radius limit will be 100 m for all sites except those within the island stratum, where the radius limit will be 200 m because of the greater extent of rocky bottoms surrounding the Channel Islands

Sampling may not be possible at some sites for a variety of reasons (e.g., kelp beds, rocky bottom, falling outside depth range of stratum, otherwise obstructed or unapproachable, etc. Sites may be abandoned if they fail to meet site acceptability criteria, or if samples at the site fail to meet sample acceptance criteria. The criteria and process guiding this assessment are described below and summarized as a decision tree in Figure 1 (benthic sites) and Figure 2 (trawl sites).

1. Occupy the target coordinates as closely as possible.

2. If occupation is not possible within the radius limit due to physical obstructions (*e.g.,* harbor facilities), or access prohibitions (*e.g.,* harbor security closures), or if the site target coordinates fall on land, or if the salinity is < 19 ppt (at estuary stratum sites), abandon the site and record the reason for abandonment in the field computer or on a field data sheet.

3. For benthic sites, if occupation is possible but target coordinates lie over bottom that cannot be sampled (e.g., rocky reef or within kelp bed, outside depth limits of stratum, etc.) as determined by visual observation and fathometer survey, attempt to find an acceptable occupation within the radius limits. Check at least two sites. If an acceptable occupation is not possible, abandon site, recording the reason for abandonment in field computer or on field data sheet.

4 For trawl sites, a pre-trawl survey using a fathometer should be conducted to determine if a trawlable track of approximately 600 m passes the target site within the radius limits. If that survey identifies unsuitable substrate or if the site is deemed otherwise unsuitable for trawling by the Cruise Leader the site should be abandoned.

5. If an acceptable occupation is possible, proceed with sampling.

6. Sample acceptance criteria are described for benthic sampling in Section 8 and for trawling in Section 9 and are summarized in the decision tree Figures 1 and 2.

E. Site Rejection Strategy

A sampling site may be rejected if any of the following occurs:

1. If the location places the site on land or in an obviously unsuitable location.

2. If the site exceeds the depth boundaries (+/- 10 %) established depth boundary and within 1 m in estuaries.

3. For benthic sites, if sampling looks possible, but suitable substrate cannot be found after three consecutive unsuccessful grab attempts at the nominal location, and after another three consecutive unsuccessful attempts at second location, the station will be abandoned completely. Adequately record the reason(s) for abandonment in the field computer, or on the field data sheet.

4. For trawl sites, if the fathometer survey identifies unsuitable substrate at three

locations within the radius limit, if any equipment is lost or damaged, or if the site is deemed unsuitable by the Cruise Leader, the site will bandoned completely. Adequately record the reason(s) for abandonment in the field computer, or on the field data sheet.

FIGURE 1. Benthic sampling site and sample acceptance process

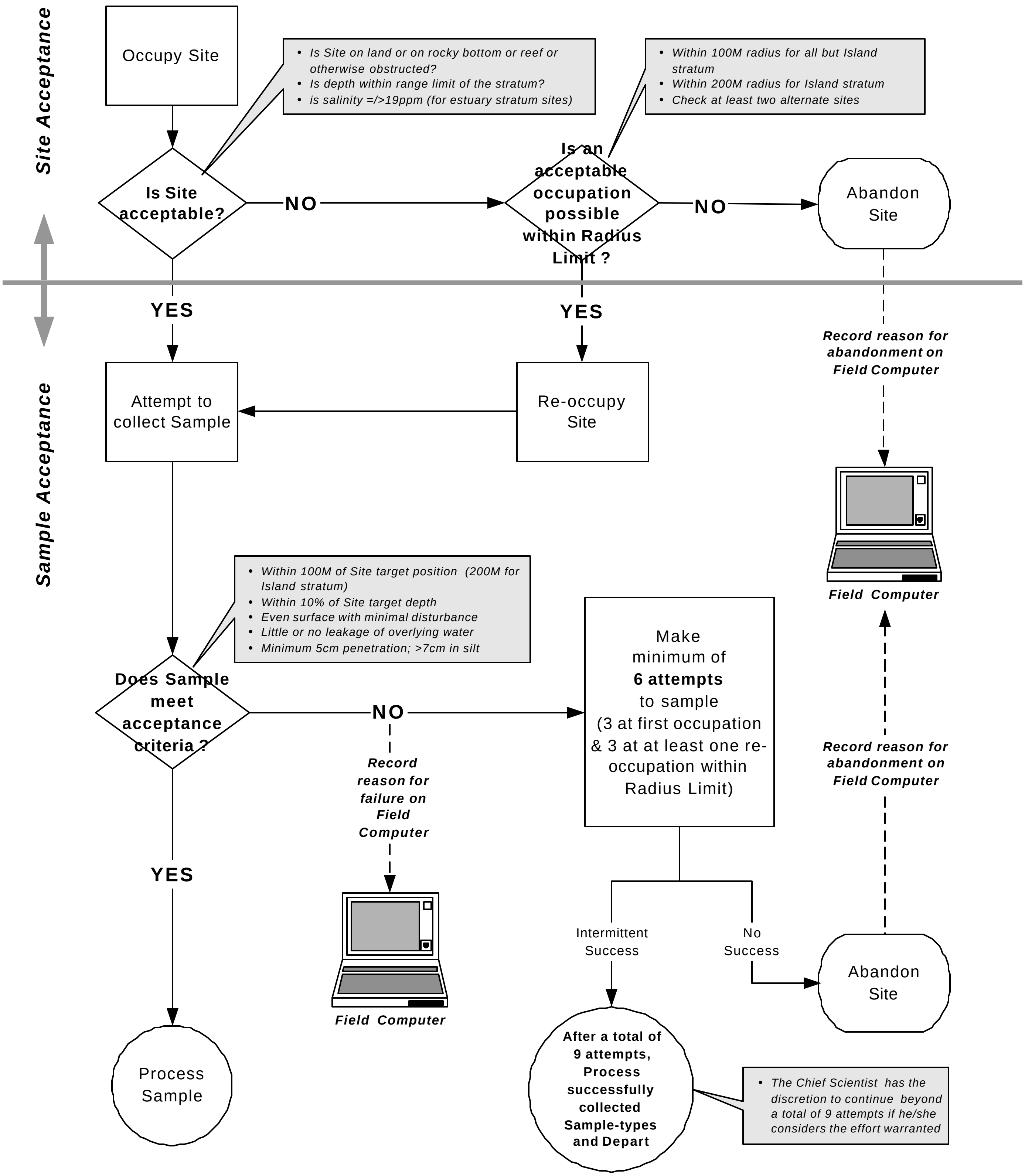
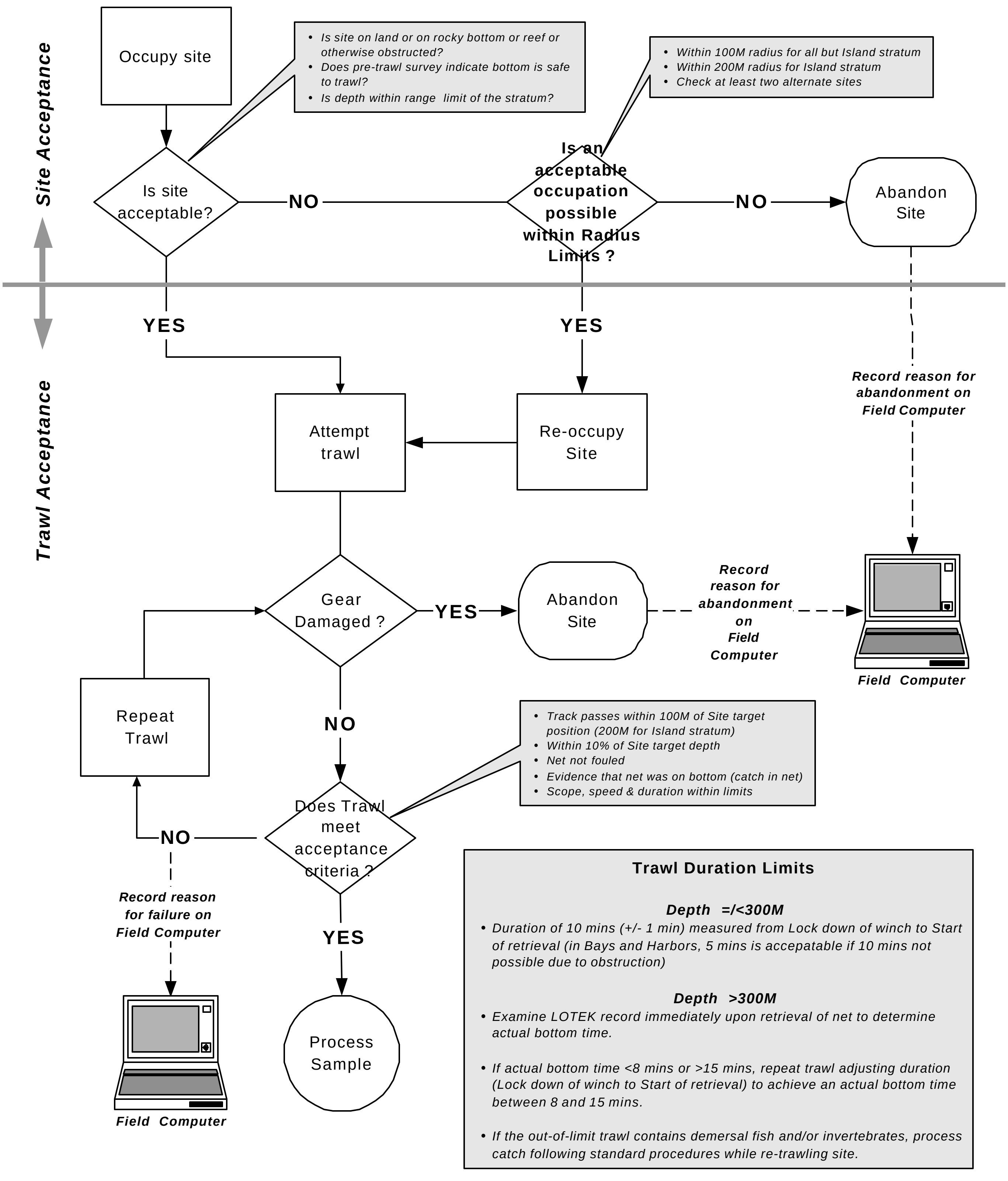


FIGURE 2. Trawl sampling site and sample acceptance process



VIII. BENTHIC SAMPLING

A. Sampling Effort

A total of 330 benthic stations will be sampled during the survey. Table 1 and Appendices 1 and 2 provide information on the total number of stations and the parameters that will be sampled by each participating organization.

B. Van Veen Grab

A 0.1 m^2 modified Van Veen grab will be used to collect sediment samples for physical, chemical, and infaunal analyses (Stubbs et al. 1987). This device is manufactured by Kahl Scientific Instrument Corporation, PO Box 1166, El Cajon, California 92022-1166 (619/444-2158) kahl@kahlsico.com. The grab may be galvanized, stainless steel, or Teflon-coated. All surfaces of the grab must be clean and free of rust. Either single or tandem Van Veen grabs are acceptable.

C. Grab Sampling Procedures

Prior to deployment, the grab is cocked with the safety key in place. The grab is then hoisted over the side, the safety key is removed. The grab is lowered at up to 2 m/sec until it is approximately 5 m above the bottom, then lowered at 1 m/sec to minimize the effects of bow wave disturbance of the surface sediment. In water depths greater than 300 m, the rate of deployment may have to be reduced to <1 m/sec in order to avoid "kiting" of the grab and/or premature tripping in the water column. After bottom contact has been made (indicated by slack in the winch wire), the tension on the wire is slowly increased, causing the lever arms to close the grab. Once the grab is back on board, the top doors are opened for inspection.

While a radius limit of 100 m (200 m for island stratum) has been established for site occupancy, once sampling has begun, the Cruise Leader will ensure that the vessel is maintained on station with as much precision as conditions allow. Because analytical results from separate grab samples will be used to characterize the benthic community biointegrity, contaminant load and, in many cases, toxicity of the sediment, each successive grab must be collected as close as possible to the others.

D. Priority of Grab Sampling

The priority of sampling at a site is 1) infauna, 2) sediment chemistry and grain size, and 3) sediment toxicity. If it is impossible to obtain all three sample types at a station, those samples successfully collected shall be processed and retained. Only those samples meeting the sample acceptance criteria and sample volume requirements (for sediment chemistry and toxicity) are considered to be successfully sampled.

E. Criteria for Acceptable Grab Samples

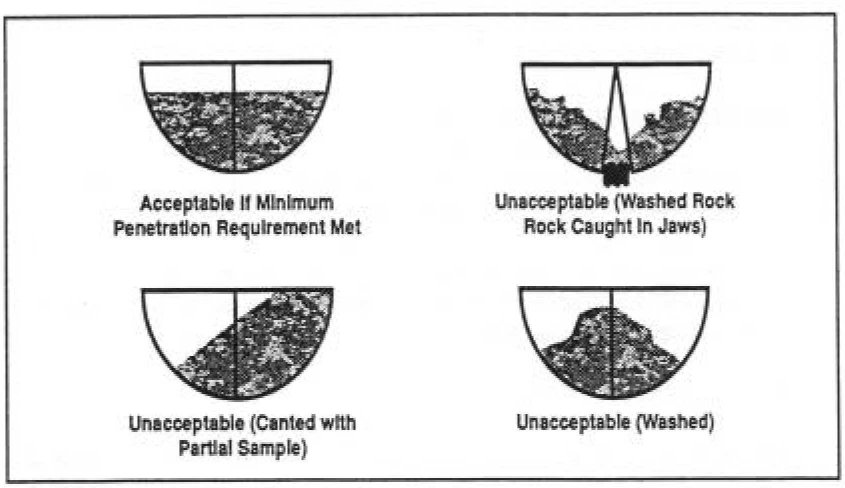
Site acceptance criteria and procedures are described in Section 7. Both site and sample acceptance criteria are summarized as a decision tree in Figure 1.

Once a site has been successfully occupied grab sampling may still prove impossible or very difficult. Different sediment types (e.g. cobble, gravel, well-sorted sands, etc.) and localities (e.g. canyons, slopes, and rocky areas) may be difficult to sample. Sediments containing rocks often create the most common problem by preventing complete closure of the grab and allowing sediment to wash out during retrieval. The randomized sampling design may cause some of the Bight'03 sampling sites to occur on these difficult sediment types or localities. Therefore, if after three consecutive unsuccessful grab attempts at a site and up to three more consecutive unsuccessful attempts a second location (within the radius limit and +/-10% of the depth of the target site or 1 m in estuaries), the station should be abandoned.

If sampling success is intermittent, the site may be abandoned after a minimum of nine (9) attempts. In this case, only the successfully (complete) collected sample types should be processed and retained. These are the minimum efforts justifying site abandonment. Sampling failures due to operational error (e.g., premature tripping) do not count towards this minimal effort. The Cruise Leader has the discretion to make a greater effort if he/she feels that it is warranted. The reason for site abandonment must be documented in the field computer or on the field data sheets.

Upon retrieval of the grab, the acceptability of the sample must be determined. Acceptability is based upon two characteristics of the sample: sample condition and depth of penetration. Sample condition is judged using criteria for surface disturbance, leakage, decanting, and washing (Figure 3).

FIGURE 3. Examples of acceptable and unacceptable grab sample condition (from Tetra Tech 1986).



An acceptable sample condition is characterized by an even surface with minimal disturbance and little or no leakage of the overlying water. Heavily canted samples are unacceptable. Samples with a large amount of "humping" along the midline of the grab, which indicates washing of the sample during retrieval, are also unacceptable. While some humping will be evident in samples taken from firm sediment where penetration has been poor, this is can be due to the closing action of the grab and is not necessarily evidence of unacceptable washing.

If the sample condition is acceptable, the overlying water is drained off and the depth of penetration determined by insertion of a plastic (rather than metal) ruler vertically along the grab midline and measuring to the nearest 0.5 cm. Sediment penetration depth must be at least 5 cm: however, penetration depths of 7-10+ cm should be obtained in silt (fine sand to clay). In habitats where sediments are unusually soft (*e.g.*, some estuary muds), it may be necessary to remove the lead weights to prevent over-topping the grab.

Extra caution should be taken to drain the overlying water from the grabs for chemistry and toxicity samples. It is recommended that a siphon be employed for these grabs to avoid disturbance and loss of the surface sediments. The overlying water in grabs intended for infaunal samples may be drained by slightly opening the jaws of the grab and allowing the water to run off, as long as all drained water is captured for screening with the sediments (see Sample Processing below).

If both sample condition and penetration are acceptable in the first grab, sampling at the station will proceed with the collection of chemistry and then sediment toxicity samples from successive grabs. **It is required that all of the grabs taken at a station be of similar sediment type and depth penetration.**

F. Benthic Sampling Event Data

The Cruise Leader is responsible for collecting all of the required information associated with each station occupation and each grab sampling event. A software application has been developed to facilitate the capture and entry of these data (Section 6). Alternatively, paper data forms may be used (Appendix 6). The required station occupation information includes:

- Station ID
- Date
- Time of day
- Agency code
- Vessel name
- System used for Navigation
- Weather and sea conditions
- Salinity (at sites in the Estuary stratum)
- Station fail code (if site is abandoned)

The required grab event information includes:
- Time of day for event (when grab on bottom)
- Latitude and Longitude at time of event (when grab on bottom)
- Depth of water (when grab on bottom)

- Distance from station target location (when grab on bottom)
- Fail code (if sample fails to meet sample acceptance criteria, see Field Sheets or Information Management Plan for codes)
- Penetration
- Sediment composition (type)
- Sediment odor
- Sediment color
- Presence of shell hash
- Sample types produced from sediment grab

G. Sediment Description

The field description of sediments is required following measurement of penetration depth. The sediment should be characterized as being coarse sand, fine sand, silt or clay, gravel, or of a mixed type. The presence of petroleum tar and shell hash should also be recorded. Obvious odors, such as hydrogen sulfide (the odor of rotten eggs), petroleum, other odors, or a lack of noticeable odors should be recorded. General sediment colors (i.e., black, green, brown, red, olive, or gray) should also be recorded.

H. Sample Processing

Benthic Infaunal Samples

After the sample description has been completed, the sediment sample intended for biological analysis is washed from the grab and screened. Raw water used to wash the samples is to be filtered in some fashion to prevent the accidental introduction of surface-water organisms. Thoroughly wash the sediment from the grab and transfer it to a sediment-washing table for screening.

In the estuary stratum, the necessity of sampling from small craft may not permit onboard screening of the sediment. In these cases the samples may be screened and processed on land at a screening station temporarily established near the sampling location. To assure that the sample does not deteriorate, such "off-site" screening must be completed as soon as possible and no longer than 90 minutes after sample collection.

A means of capturing all water drained from the grab, the grab sample, and the wash water must be used. Typically, a tub ($\geq$70 L capacity) is positioned under the grab. The use of a sediment-washing table is recommended, but not required. The table is useful in that provides a flat, smooth surface over which to spread and wash the sample, thereby providing a means of gently breaking up the sediment before it runs off the end of the table into the screen box. The screening box must be equipped with a stainless steel mesh with 1.0-mm openings. Wire diameter should be similar to that found in the U.S. Standard 1.00 mm Sieve (i.e., 0.58 mm). The surface area of the screen should be adequate to easily accept the sample without build up. Typical surface areas used in surveys in the Bight are 1500 to 2100 cm^2. While washing the sample, control the water pressure to avoid damaging the organisms. Minimize direct application of water from the hose to the material and organisms collecting on the screen.

Once the sample has been washed through the screen, transfer the material (debris, coarse sediment, and organisms) retained on the screen to a sample container. Label the sample container with an external label containing the sampling agency name, station name, sample type, date, and "split number" (i.e. 1 of 1, 2 of 3, etc.) if required. An internal label bearing the same information is placed inside the infaunal samples. This label can be written in pencil or indelible ink on 100% rag paper, poly-paper, or other paper of a quality suitable for wet labels. The sample container must have a screw-cap closure and be sufficiently large to accommodate the sample material with a head-space of at least 30% of the container volume. A sample may be split between two or more containers. However, each container must have external and internal labels (as described above) with the appropriate "split number" clearly marked. Field crews should have a broad range of sample container sizes available to them, with none less than 16 oz (0.47 L) capacity.

Gently remove the material retained on the screen, taking care to avoid damaging the organisms. The sample container should be filled to approximately 50 to 70% of capacity with screened material. After the bulk of material has been transferred to the container, closely examine the screen for any organisms caught in the mesh. Remove any organisms with forceps and add them to the sample container. Thoroughly wash the screen box and scrub the mesh before the next sample is screened.

All infaunal samples will be treated with a relaxant solution for approximately 30 minutes prior to fixation. Either an Epsom salts ($MgSO_4$) solution or a propylene phenoxytol solution (formulations below) may be used for this purpose. Relaxant solutions may be used as the diluent water for the fixative, or may be decanted after exposure and replaced with diluted fixative. If it is used as diluent water, fill the sample container to 85 to 90% of its volume, close the container and invert it several times to distribute the solution. Leave the sample in the relaxant for 30 minutes. After 30 minutes, top off the container with enough sodium borate buffered formaldehyde to achieve a 10% formalin solution. Close the container, once again, and invert it several times to assure mixing. Store the sample for return to the laboratory.

If the relaxant solution is not used as the diluent water, the relaxant must be removed from the sample container and replaced with 10% buffered formalin. After the 30 minutes of treatment, decant the relaxant from the sample through a screen with a mesh size of 1.0 mm or less. Insure that all animals are removed from the screen and placed in the sample container. Fill the container with sodium borate buffered 10% formalin rather than undiluted formaldehyde, then close the container, invert it several times and store it for return to the laboratory.

Relaxant and fixative stock solution alternatives are as follows:

1)	Epsom salts relaxant solution:	1.5 kg Epsom salts ($MgSO_4$ @ $7H_2O$) per 20 L of freshwater.
2)	Propylene phenoxytol solution:	30 ml propylene phenoxytol to 20 L of seawater.
3)	Buffered formalin solution:	50 g sodium borate ($Na_2B_4O_7$) per liter of

formalin.

4) Buffered 10% formalin solution: 1 part buffered formalin to 9 parts fresh or salt water.

At the end of the sampling day the samples will be returned to the laboratory and stored in fixative for no less than 72 hours. Within two weeks of collection they will then be washed and transferred to preservative according to the procedures described in section 1 of the Bight'03 Macrobenthic (Infaunal) Sample Analysis Laboratory Manual (2003).

If the samples will be analyzed by other laboratories, they will be transported (in preservative) to SCCWRP for later distribution. It is recommended that SCCWRP (Darrin Greenstein, 714/372-9224) be contacted prior to delivery of samples so that arrangements can be made to transfer custody. A **completed chain of custody form** must accompany all shipments of samples (Appendix 6). Allow time for verification of the chain of custody.

Sediment Chemistry Samples

Following collection of benthic infauna, the next grab(s) will be taken for sediment chemistry samples. More than one grab may be necessary to meet the sample volume requirements of this sample type. If a second grab is necessary, the sediment from each grab will be distributed evenly among the individual sample containers. Sediment samples will be collected by randomly sub-sampling the top 2 cm of the undisturbed surface material with a stainless steel scoop (a plastic scoop is acceptable for TOC and grain size samples). At the very minimum, scoops will be washed with soap and water and rinsed with de-ionized (DI) water between stations. Use of a new scoop with each sample is also acceptable. Sediment in contact with or within 1 cm of the metal sides of the grab will be avoided to prevent sample contamination.

The target volume for the sediment chemistry samples is 100 grams for grain size and 200 grams for the other three analytes. The goal is to collect enough sediment at each site to satisfy the target volumes for these samples. If conditions are particularly difficult at any sampling site and nine grabs have been attempted with only intermittent success, the minimum acceptable volume for the sediment chemistry samples is 100 grams. If less than 100 grams has been collected for any of the analytes, the samples will be discarded and the reasons for incomplete sampling at the site will be recorded.

The following container types, samples sizes, and storage requirements will be used with the analytical laboratory supplying all sample containers for all parameters:

1) **Sediment Grain Size** – Using a stainless steel or plastic scoop, approximately 100 g of sediment material will be collected at each station. The sample shall be placed in a 4-oz (118 mL) whirlpak, plastic, or glass container, taking care to leave an air space at the top. Samples should be stored at approximately 4^{o} C by placing them on wet ice or in a refrigerator until returned to the laboratory. **Do not freeze these samples.** They should be returned to the analytical laboratory within a week of sampling.

2) **Total Organic Carbon** -- Using a stainless steel scoop, approximately 200 g of sediment material will be collected at each station. The sample shall be placed in an 8-oz (~250 mL) glass container, with a Teflon-lined lid filling the container 80% full, taking care to leave an air space at the top. A minimum of 100 g is acceptable but only if sampling cannot otherwise be completed at site.

   Samples should be stored at <4° C by placing them on wet ice or in a refrigerator, but must be frozen within 24 hours. If frozen, they should be returned to the laboratory within a week; if not, they should be returned to the analytical laboratory within 24 hours.

3) **Trace Metals** -- Using a plastic or stainless steel scoop, approximately 200 g of sediment material will be collected at each station. The sample shall be placed in a 8-oz (~250 mL) plastic or glass container, with a Teflon-lined lid filling the container 80% full, taking care to leave an air space at the top. A minimum of 100 g is acceptable but only if sampling cannot otherwise be completed at site.

   Samples should be stored at <4° C by placing them on wet ice or in a refrigerator but must be frozen within 24 hours. If frozen, they should be returned to the laboratory within a week; if not, they should be returned to the analytical laboratory within 24 hours.

4) **Trace Organics** -- Using a stainless steel scoop, approximately 200 g of sediment material will be collected at each station. The sample shall be placed in a 8-oz (~250 mL) glass container, with a Teflon-lined lid filling the container 80% full, taking care to leave an air space at the top. A minimum of 100 g is acceptable but only if sampling cannot otherwise be completed at site.

   Samples should be stored at <4° C by placing them on wet ice or in a refrigerator but must be frozen within 24 hours. If frozen, they should be returned to the laboratory within a week. If not frozen, they should be returned to the analytical laboratory within 24 hours.

If any samples need to be transported to another organization for processing, they should be packed in dry ice and shipped to SCCWRP via overnight express, or a local carrier.
Labeling of sample containers will be the responsibility of the field sampling crew. The following minimum information will be required on each sample label: 1) sampling agency name; 2) station number; 3) sampling date; and 4) parameter.

Samples that will be analyzed by the organization conducting the field collection will be returned to their laboratory by the field crew. Samples to be analyzed by other laboratories will be transported to SCCWRP for later distribution. It is recommended that SCCWRP (Darrin Greenstein, 714/372-9224) be contacted prior to delivery of samples so that arrangements can be made to transfer custody (Appendix 6). A **completed chain of custody form** must accompany all shipments of samples. Allow time for verification of the chain of custody.

Sediment Toxicity Samples

Following the collection of sediment chemistry samples, grabs will be taken for sediment toxicity analysis. More than one grab may be necessary to meet the sample volume requirements of this sample type. If a second grab is necessary, the sediment from each grab will be distributed evenly among the individual sample containers. Sediments will not be homogenized in the field.

Sediment samples will be collected by randomly sub-sampling the top 2 cm of the undisturbed surface material with a plastic scoop. At the very minimum, the scoop will be washed with soap and water and rinsed with de-ionized (DI) water between stations. Use of a new scoop with each sample is also acceptable. Sediment within 1 cm of the metal sides of the grab will be avoided to prevent sample contamination. High-density polyethylene (HDPE) containers will be used for collection of sediment toxicity samples. The toxicity laboratories performing the required analysis will provide sample containers.

Sample volume requirements for sediment toxicity samples are:

- 2.5 liters of sediment is the target volume at stations where sediment collection is not problematic. However, if after nine grab attempts at a site yielding intermittent success insufficient sample volume is available, 1.0 liter of sediment will satisfy the minimum sampling requirement. Sample volumes less than 1.0 L will be considered unacceptable, the sample will be discarded and the reason for incomplete sampling at the site will be recorded. The 2.5 L of sediment will be distributed among three high-density polyethylene (HDPE) containers with Teflon-lined lids. Each labeled container should then be refrigerated, or placed on wet ice. **Do not freeze these samples.** Samples may be held in the field, or laboratory, on wet ice, or in a refrigerator at 4^{o} C, for no more than three days before transport to the laboratory or SCCWRP. The transport time will not exceed 24 hours and storage temperature will not exceed 4^{o} C.

Labeling of sample containers will be the responsibility of the field sampling crews with the following minimum information required on each sample label: 1) station number; 2) sampling date; 3) parameter; and 4) split (if required).

If the samples will be analyzed by other laboratories, they will be transported to SCCWRP for later distribution. It is recommended that SCCWRP (Darrin Greenstein, 714/372-9224) be contacted prior to delivery of samples so that arrangements can be made to transfer custody. A **completed chain of custody form** must accompany all shipments of samples (Appendix 6). Allow time for verification of the chain of custody.

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IX. TRAWL SAMPLING

A. Purpose

The purpose of trawl sampling is to obtain data on the abundance, biomass, diversity, and disease prevalence of demersal fish and invertebrate assemblages. It is also used to collect fish and invertebrates for tissue contaminant analysis. This information is useful in characterizing possible anthropogenic effects on demersal fish and invertebrate populations. Mearns and Allen (1978) provide a comprehensive description of how small otter trawls should be designed and used for conducting biological surveys in coastal waters.

B. Sampling Effort

A total of 268 trawl stations will be sampled during the survey. Information regarding trawl stations and the corresponding parameters that will be sampled by each organization at each of these sites are listed in Table 1 and Appendix 1.

C. Collection Permits

Prior to collecting fish and invertebrate specimens in the field, each organization must contact their local office of the California Department of Fish and Game (CDFG). The caller will be asked for his or her name, scientific collector's permit number, date, time, and area of sampling, type of gear to be used, vessel size, color, CF number (or documentation), number of persons in party, and organisms targeted for collection. This information can also be faxed to the local CDFG office prior to sampling. Both the permit and the permit holder must be onboard during sampling and it must be presented to any CDFG warden, or personnel who request to see it. The phone//FAX numbers of the local offices of the CDFG are as follows: San Diego, (858) 467-4201/(858) 467-4299; Los Alamitos, (562) 342-7108/(562) 342-7139.

D. Otter-Trawl Specification

A semiballoon otter trawl (Figure 4) will be used to collect epibenthic invertebrates and demersal fish. Net dimensions are as follows: 7.6-m headrope (25 ft); 8.8-m footrope (29 ft); 3.8-cm (1.5 in) body mesh; and a 1.3-cm cod-end mesh (0.5 in). This net will have 22.9-m (75 ft) long bridles made of 1.0-1.6 cm (3/8 to 5/8 in) diameter rope (e.g., Samson braid). Typical otter boards (doors) will have a width of 76 cm (30 in), height of 50 cm (20 in), and a suggested weight of 16 kg (35 lb) (Figure 5). Slight deviations (< 10%) from the dimensions are acceptable. The door chains should be 5-mm (3/16 in) in diameter and should have the following numbers of links: front top -- 12; front bottom -- 11; back top -- 17; back bottom -- 16. The actual specifications of how any trawl door is set up may depend on the manufacturer of the otter trawl, but the user of the equipment should be sure to follow the factory recommended set-up procedures to ensure that the net fishes appropriately in the field.

The Bight'03 survey will require two additions to the trawl specifications: 1) Non-crushable floats are required for any nets used to trawl deeper than 300 m; and 2) Lotek archival tags will be attached to one of the otter trawl boards to measure water temperature, depth and time of the individual trawls. Once started, the archival tag will run until its memory is full (approximately 12 hours), at which point it will shut off. The memory is non-volatile, but will be lost when the tag is started the next time. To reduce the risk of losing data, the tag should be downloaded at the end of each field day.

FIGURE 4. Semi-balloon otter trawl recommended for marine receiving-water monitoring programs in southern California (modified from Mearns and Allen, 1978)

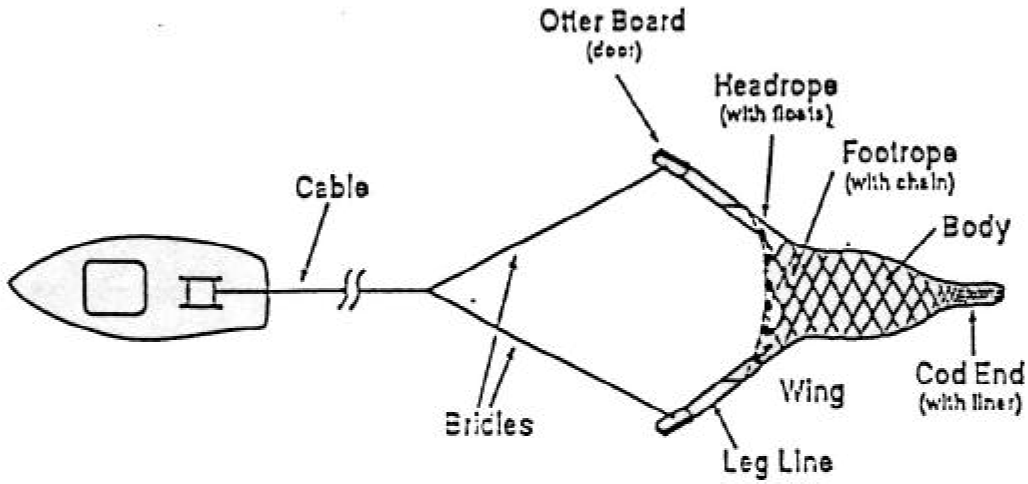
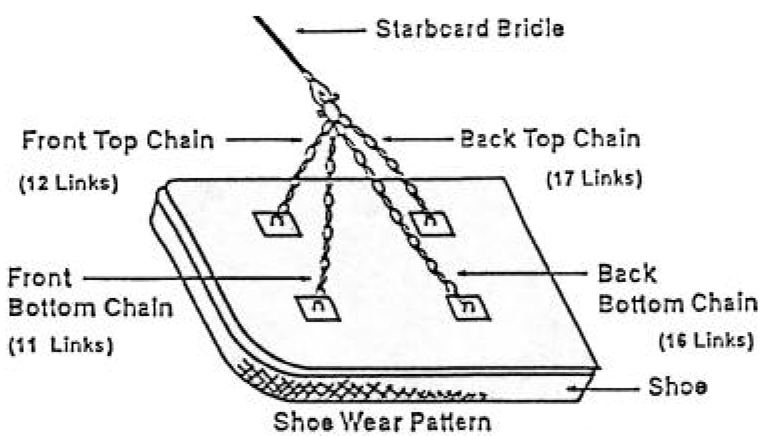


FIGURE 5. View of an otter board of a semiballoon otter trawl with recommended numbers of chain (5-mm or 3/16 in. diameter) links (modified from Mearns and Allen, 1978)

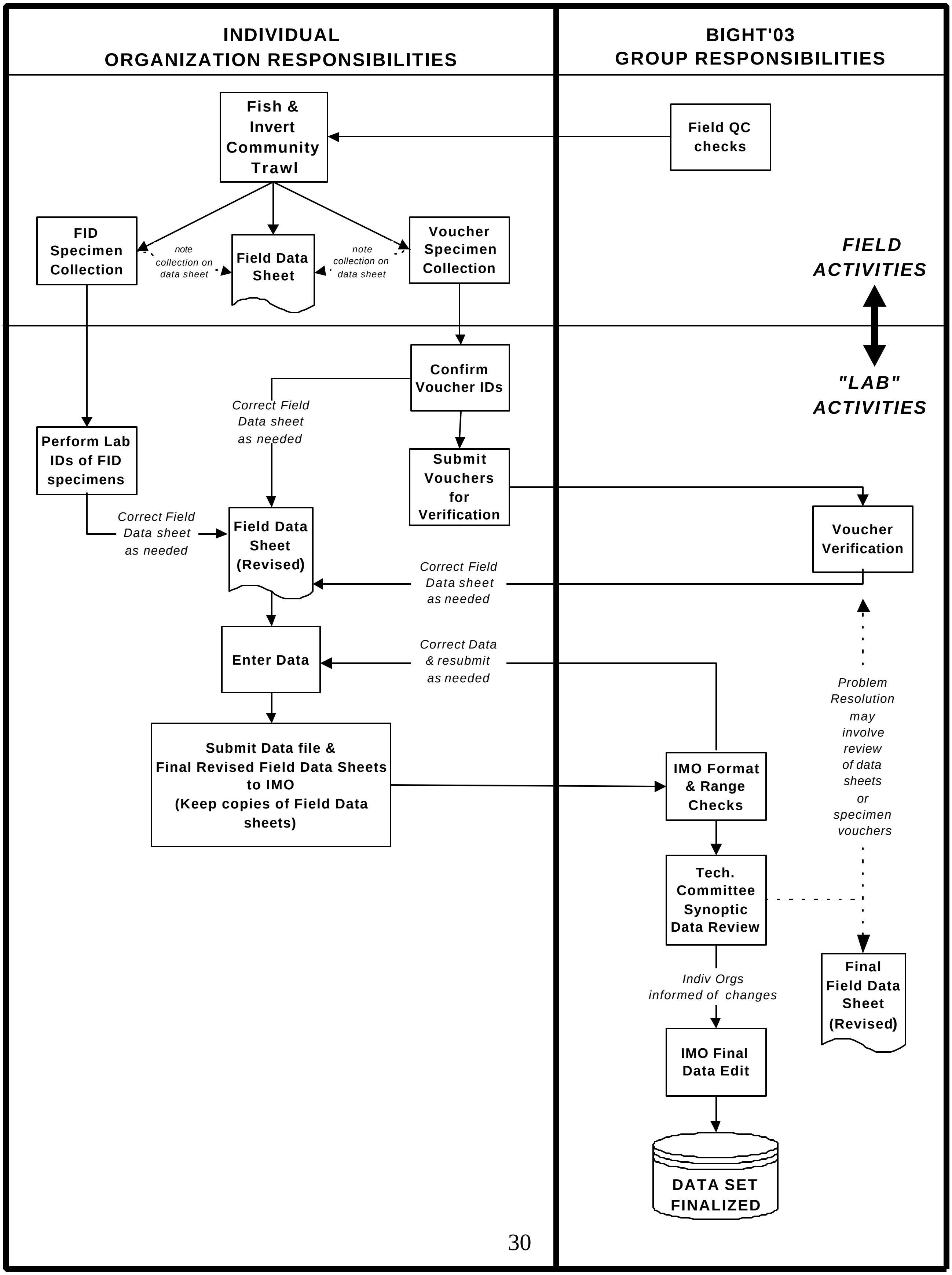


E. Trawl Data Flow and Responsibilities

Unlike benthic infauna and sediment chemistry, the collection of trawl data (identifications, measurements, etc.) is largely a field activity for which there is little opportunity to clarify or correct errors. Therefore, it is important that the field personnel appreciate the ultimate fate of the data records they are creating and assure that their field records support subsequent steps in the data creation process. For example, specimens collected as vouchers or as FID specimens must be labeled under the same name as recorded on the field data sheet. This allows these specimens to be unambiguously associated with the data records for purposes of data QC or revision.

In addition, each organization conducting trawling must complete all stages of sample analysis (lab Ids, voucher confirmation, data sheet revisions, etc.) prior to submitting data and voucher specimens to the project for further review. The flow of data from the trawl to final data set and the parties responsible for completion of each stage is summarized in Figure 6.

Figure 6. Trawl data flow and responsibilities



F. Trawl Sampling Event Data

The Cruise Leader is responsible for collecting all of the required information associated with each station occupation and each trawl sampling event. A software application has been developed to facilitate the capture and entry of these data (Section 6). Alternatively, paper data forms may be used (Appendix 6). The required station occupation information includes:

- Station ID
- Date
- Time of day
- Agency code
- Vessel name
- System used for Navigation
- Weather and sea conditions
- Station fail code (if site is abandoned)

The required trawl event information includes:

- Time of day at for marks during event (net over, start trawl, end trawl, on deck)
- Latitude and longitude at each time-marks during event
- Depth of water at Start Trawl and End Trawl time-marks
- Distance from station target at closest point of passage
- Fail code (if sample fails to meet sample acceptance criteria, see Field Sheets or Information Management Plan for codes)
- Wire Length
- Whether Lotek Information was Collected
- Type of Trawl (community or tissue)

G. Net Preparation

The trawl components should be properly prepared prior to trawling so that the trawl can be deployed in an orderly and safe manner upon arrival at a station. The net should be laid out and stacked on the stern of the vessel in the same configuration that it will be deployed: cod-end to the stern, floats up, and foot rope down. The trawl net should be checked to make sure that the cod-end is tied correctly, the doors should be connected properly to the leg lines, and the bridles should be securely fastened to the doors and to the tow wire.

H. Station Occupation

Every effort should be taken to ensure that any particular trawl track passes the station coordinates at a distance of no greater than 100 m (200 m for Island stratum), and that the trawl course varies no more than +/- 10% of the target depth (Figure 2). The trawl track can be plotted prior to sampling so that a successive series of waypoint locations along the track can be obtained. These coordinates can then be entered into the DGPS and then retrieved at the time of sampling to ensure that the vessel maintains its course along the trawl track.

I. Pre-Trawl Survey

Prior to trawling at a new station, it is important to conduct a pre-trawl survey of the trawl course. Trawl gear is likely to be lost if it becomes snagged on bottom obstructions and replacement of nets can be costly. The trawl course at a previously unsampled station should be evaluated by use of a fathometer. This pre-trawl survey can enable the navigator to avoid uncharted reefs and other obstacles. If obstacles are encountered, resurvey a new trawl course. The Cruise Leader alone has the authority to decide whether to trawl or abandon an unknown station. This survey should always be conducted at a new sampling site to determine whether the station is acceptable or if it should be abandoned. The pre-trawl survey should follow the expected trawl course along the isobath and the fathometer will be examined for evidence rocks and other obstacles.

If the first run indicates that a particular site is unacceptable, another survey will be conducted within 100 m or the original location and within +/-10% of the original depth. If this attempt is unsuccessful, a third attempt will be conducted at a different location using the same protocols (100 m of the original location, and +/-10% of original depth). The site will be abandoned after three unsuccessful attempts (Figure 2).

J. Trawling

Trawls will be towed along, rather than across, isobaths. While the vessel is underway the net and doors are placed in the water. It is important that the floats skim the surface and that the net is not entangled (e.g., crossed leg lines, bunched or hooked portions of the net) prior to paying out the bridles. This small step could mean the difference between a successful or unsuccessful trawl. The bridles should be paid out by personnel on either side of the net, so as to avoid becoming entangled in the rigging during deployment.

Use of the proper scope (i.e., length of hydrowire paid out versus the water depth) is important for successful trawls. After the net touches the bottom, a sufficient length of hydrowire (towing wire) should be paid out to ensure that the net is pulled from a horizontal rather than a vertical position. Insufficient scope will prevent the net from consistently fishing the bottom and will result in a no-catch, or a short-catch situation. In general, the required scope declines with increasing depth because the additional weight of the hydrowire enhances the horizontal component of the towing forces (Table 2).

TABLE 2. Recommended scope and length of wire for trawling at different depths in the Southern California Bight.

Water Depth (m)	Tow Wire Out (m)[1]	Approximate Scope (m)
<5	50	10.0:1
10	80	8.0:1
30	180	6.0:1
60	300	5.0:1
100	400	4.0:1
150	550	3.6:1
175	625	3.5:1
200	700	3.5:1
500	1,100	2.2:1

[1] Note that 25 m of bridle is included in this scope.

These scopes are for 1.0 cm (0.38 in) hydrowire. These scopes will have to be adjusted accordingly when using a different diameter of hydrowire.

Trawling is conducted at a speed-over-ground of 1.0 m/sec (or 1.5 to 2.0 knots). At stations in less than 300 m water depth, the net is towed for 10 minutes, measured on deck from start of trawl to end of trawl (i.e., lock down of winch to start of retrieval). Under normal circumstances, this distance over ground is equivalent to 450-600 m. Trawl speed and distance can be determined by DGPS. In confined areas (e.g. bays and harbors) the trawl duration may be reduced to 5 min, or a distance over ground of 225-300 m.

At stations in depths greater than 300 m, the archival tag is downloaded immediately upon completion of the trawl and the on-bottom duration determined. If the on-bottom duration is <8 minutes or >15 minutes, the trawl is repeated, adjusting the on-deck duration as necessary to fall within the limits and as close to 10 minutes of on-bottom time as possible. If there are demersal fish and invertebrates in trawls falling outside the on-bottom duration limits, the catch is processed while the station is being re-trawled. A check box is provided on the data sheets to indicate that the data are from a trawl that is outside the on-bottom time limits.

At the end of the prescribed trawl time, the net is retrieved and brought onboard the vessel. The cod-end is then opened and the catch deposited into a tub or holding tank. The catch is subsequently released to the scientific crew for processing.

K. Criteria for Accepting a Trawl

If the trawl is retrieved with little or no catch in the cod-end, its acceptability will be evaluated according to whether the trawl was conducted properly. The criteria used to evaluate the success of any trawl include making sure that proper depth, scope, speed, and distance (or duration) were maintained, whether the net was fouled (net tangled), and whether the catch shows evidence that it was on the bottom (e.g., rocks, benthic invertebrates, benthic fish) (Figure 2). If any of trawl procedures were not followed, if the net was fouled or torn (the tear must be sufficient to allow escapement), or if there was no evidence of contact with the bottom (downloading the Lotek information can be useful), the trawl will be considered unacceptable and the site will be retrawled. When evaluating the situation to decide whether to abandon or retrawl a station, the Cruise Leader should keep in mind that the goal is to collect the best sample possible.

If a retrieved net has been torn sufficiently to allow escapement during the course of a trawl, the station will be abandoned. If the trawl hangs up on the bottom, the site can be resampled or abandoned at the discretion of the Cruise Leader. If retrawling that station proves unsuccessful after another two attempts, the site will be abandoned (Figure 2).

L. Sample Processing

Sorting

The trawl catch will be sorted on deck into containers. The catch should initially be rough sorted into major categories (e.g., urchins, shrimp, other invertebrates, flatfishes, rockfishes, other fishes). The categories used are not important, but it is more efficient to sort into rough categories before identifying organisms to species. Trawl debris should also be sorted into containers for processing.

Trawl Debris

Debris collected during any trawl should be quantified by recording the specific types of material and their quantities on the Trawl Debris Data Sheet (Appendix 6). Trawl debris volumes are quantified using the following categories: present (1); low (2-10); moderate (11-100); and high (>100). The approximate weight of each type should also be estimated using these categories: trace (<0.1 kg); low (approx. 0.1-1.0 kg); moderate (approx. 1.1-10.0 kg); and high (>10.0 kg).

Identification

The goal is to provide species-level identifications for all fish and invertebrates captured in the trawl. Most, if not all, of the trawl-caught organisms should be identifiable to species in the field using the recommended taxonomic keys and field guides. Species of fish and invertebrates that cannot be reliably identified to species in the field should be returned to the laboratory for further identification. In these instances, it is better that the field crew recognize their taxonomic limitations, record "FID" (further identification) on the field sheet and include descriptions of any attributes that may later aid in the identification of that specimen. Under no circumstances should an organism be discarded if the identity is in question.

When the "FID" organisms have finally been identified, the correct identity of the species should be recorded on the original data sheet. If the laboratory identity differs from that recorded in the field, the original name should be crossed out with a single line only; do not erase the original name. If a specimen cannot be identified by the sampling organization, it will be sent to SCCWRP for further analysis.

Although all fish collected during Bight'03 will be identified to the lowest possible taxon (either in the field or in the laboratory), only certain trawl-caught invertebrates meeting very specific criteria will need to be identified to that level. There are likely to be many small infaunal and pelagic species that will be taken incidental to the trawl catch. These need not be processed or documented. Only epibenthic invertebrate organisms greater than 1 cm in any dimension will be included in the data. Colonial and pelagic organisms will be noted, but do not need to be enumerated. The presence of obvious fish parasites, such as leeches or cymothoid isopods, should be noted.

A recommended list of field guides and taxonomic aids for identifying fish and invertebrates will be distributed to all of the participating organizations prior to the survey. The most basic and comprehensive guides for fish are Miller and Lea (1972) and Eschmeyer et al. (1983). Allen (1977) provides information for identifying juvenile rockfishes (*Sebastes* spp.), while Orr et al. (2000) and Love et al. (2002) provide keys to larger rockfishes. Kramer et al. (1995) provides information for identifying flatfishes. Generally, there are no widely comprehensive guides to the epibenthic invertebrates.

Either common or scientific names of fish may be used in the field, however, in the case of invertebrates, only scientific names are permissible. Use standard common and scientific names of fishes and scientific names of invertebrates given in a list of trawl-caught species of fishes and invertebrates in southern California that have been distributed to organizations prior to the survey. For species not in these lists, use only standard common and scientific names of fishes given in Robins et al. (1991), or scientific names of fishes from Eschmeyer (1998), and common names of invertebrates from SCAMIT (2001).

For every species caught, each organization will provide at least one representative of that species to the Bight'03 voucher collection (see Voucher Collection)

Each organization should have a kit containing a variety of tools which will aid in field identification. The kit should include forceps (small with sharp points and large with blunt points), a hand lens, dividers or calipers, dissecting needles, scalpels with scalpel blades, probes, and plastic rulers (marked in millimeters).

Length Measurement

All fish species will either be measured on measuring boards or, for very large specimens, by a meter stick or tape measure. A measuring board typically consists of either a flat or trough shaped board with a part of a meter stick running down the middle. A smaller board (cross board) is attached across the zero-end of the meter stick. Centimeter size-classes are marked along the side of the measuring board with the number of the size class marked next to the appropriate centimeter.

When measuring a fish, the head should be pushed against the cross board at the zero-end of the measuring board. Standard length in bony fishes is obtained by measuring from the anterior tip of the head to the posterior end of the caudal peduncle, located slightly anterior of the externally visible origin of the caudal fin rays. Bending the tail laterally upwards and noting the point of sharp flexure can most closely approximate where standard length is measured (Figure 7). Total length will be measured for all cartilaginous fishes. Wingspan will be measured in addition to total length for stingrays because the tips of their tails are frequently broken off (Figure 8).

The length of all fish specimens will be reported in size classes of 1 cm intervals (Mearns and Allen 1978). The first centimeter size class (size class number 1) extends from >0 to 1.0 cm; size class 2 extends from >1.0 to 2.0 cm, and so forth (Figure 9).
All species will be recorded on the Trawl Fish Species Data Sheet, or Trawl Invertebrate Species Data Sheet (Appendix 6). For fish species with 10 or fewer individuals, each size class measurement will be recorded on the Trawl Fish Species Data Sheet, separated by commas. For species with more than 10 individuals, the species identifications and totals are listed on the data sheet, but the individual sizes are tallied on a separate Fish Size-Class Data Sheet (Appendix 6).

An attempt should be made to size-class all fish. For the rare occasions when size classing is not possible (e.g., a huge catch of a single species), a subsample of several hundred fish should be measured. When this occurs, the reason should be noted on the data sheet. (Note: Catches of greater than 2,300 individuals of a single species have been measured in past surveys).

FIGURE 7. Endpoints for Standard Length (SL) and Total Length (TL) for bony fish.

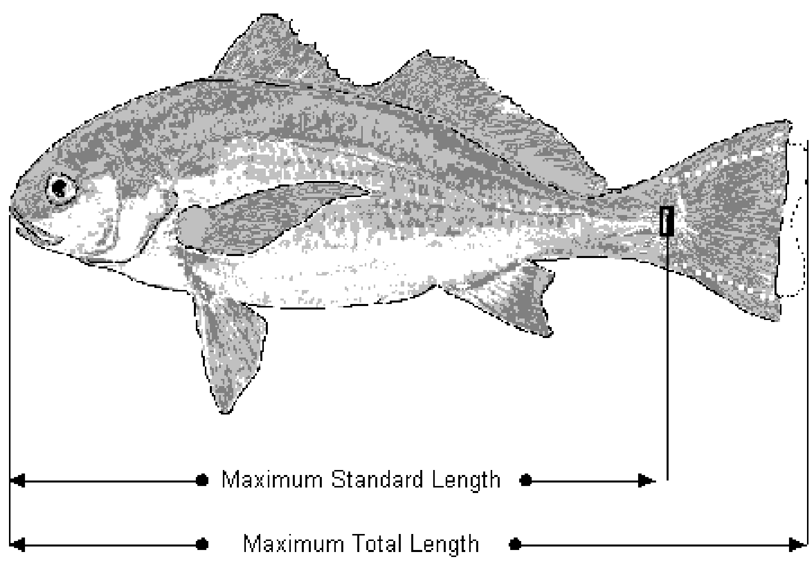


FIGURE 8. Endpoints for Wingspan (WS), Standard Length (SL), and Total Length for measuring the length of bony and cartilaginous fishes.

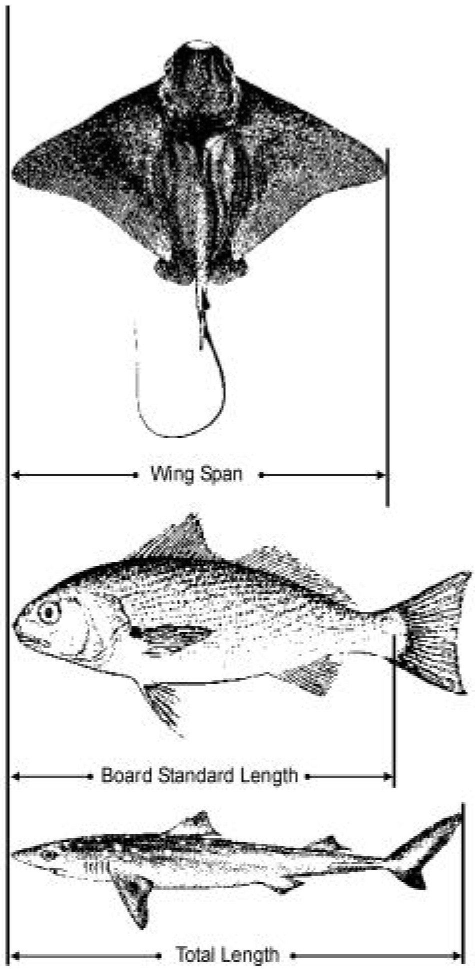
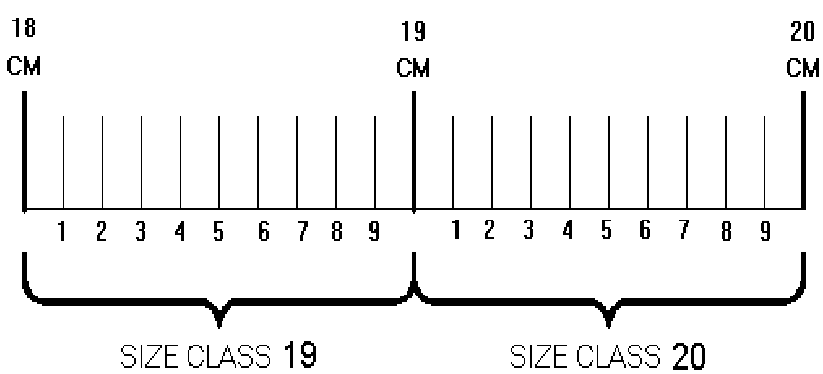


FIGURE 9. Relationship of centimeter size classes to millimeter values using centimeter and millimeter marks on a meter stick where size class 20 is defined as 19.1 to 20.0 mm.



Weighing

Weight data collected from fish and invertebrate species will be used to estimate the total biomass of the catch and for each species where practical. Each organization should have a range of spring scales that are capable of weighing to the nearest 0.1 kg. The scales should be calibrated at the start of each trawling day using a standard set of at least three weights. Weighing will be done using a pre-weighed tare bucket, or another suitable container (e.g., plastic net bags). If a tare bucket is used, the bottom should have many holes drilled through it to allow any excess liquid to drain off before the weight is recorded. Tare buckets should be washed periodically to remove the accumulated slime.

The total biomass of each species will be measured with a spring scale. Species with a biomass greater than 0.1 kg will be recorded to the nearest 0.1 kg. The tare container weight will be subtracted from the gross weight (species plus tare container) to give the weight of the species (net weight). Tare and gross weight can be recorded on the data sheet but are not required. Small species weighing less than 0.1 kg will be recorded as <0.1 kg. These will be set aside and weighed together to provide a composite weight. Composite weights greater than 0.1 kg will be recorded to the nearest 0.1 kg. Composite weights of less than 0.1 kg will not be rounded; they are to be recorded as <0.1 kg. There will be one composite weight for fish and one composite weight for invertebrates. These weights will assist in calculating the total biomass of the catch.

Large organisms may be weighed individually. Individual weights of smaller specimens may also be collected using a range of scales capable of weighing to the nearest 0.1 g.

Enumeration

Fish are enumerated while measuring them. The total number of each species (including size-classed species) should be recorded on not only the Fish Species Data Sheet, but also the Fish Size-Class Data Sheets for species represented by more than 10 individuals.

Most invertebrates will be enumerated following identification. However, the number of individuals in particularly abundant species may be estimated from the total biomass of the species at a later time. First, the number of individuals that comprise a minimal weight can be used to provide a "number of individuals per kilogram" coefficient. The total biomass of a species divided by the number of individuals per kilogram yields the total number of individuals in the sample. The aliquot of specimens that will be used to determine weight for a species should be sufficiently large (e.g., several kilograms) so that it falls within the mid to upper range of the spring scale being used; this prevents the inherent inaccuracy of the spring scale at the low end from being multiplied throughout the entire biomass calculation.

Examination for Gross Pathology

During the identification and measurement procedures, fish and invertebrates will be examined for gross pathology. This entails a scan of an individual organism for anomalies and noting the type of pathology (by abbreviation) next to the length of organisms (for fish) during measurement on the appropriate data sheet. The following anomalies will be noted for fish:

1) fin erosion
2) tail erosion
3) tumors
4) external parasites (e.g., copepods, isopods, leeches)
5) eye parasites (i.e. *Phrixocephalus)*
6) color anomalies (ambicoloration, albinism) (Mearns and Haaker 1973)
7) skeletal deformities (Valentine 1975)
8) lesions
9) other anomalies

An observation should be noted next to the individual length on the Fish Species Data Sheet and described in the comments section.

For invertebrates, burnspots, parasites, and other anomalies will be noted in the comment section of the Trawl Invertebrate Species Sheet (Appendix 6).

Fin erosion can be found on the dorsal, anal, and caudal fins of flatfishes, and on the lower caudal fin and pelvic fins of bilaterally symmetrical fishes. Tail erosion occurs on the top and bottom of the caudal fin or along the entire posterior caudal fin of bilaterally symmetrical fishes. Tumors can be smooth and rounded (angioepithelial nodules) or furrowed (epidermal papillomas). Externally obvious copepod parasites occur on the eye, fins, or body of fish. Cymothoid isopods occur in the gill cavities of fish or on the body; they often fall off. Leeches occur on the body of some flatfishes. Skeletal deformities include crooked backs, snub noses, or bent fin rays. Lesions include sores that do not appear to be caused by net damage. Burnspot disease is found on crabs and some shrimps; its lesions resemble cigarette burns. Parasites of invertebrates include bopyrid isopod parasites of shrimp.

Representatives of fish and invertebrates exhibiting each new instance of disease or which have a different parasite should be returned to the laboratory and vouchered.

<u>Processing Stage Monitoring</u>

Accidental omissions can occasionally be made if a bucket of organisms is not processed. This can be avoided by attaching a colored rubber tag (made of a square with a slit in one side) to the handle of each bucket to indicate a particular stage of processing. For instance, different tags can represent that the bucket is ready for identification, measurement, weighing, preservation, or discarding. As the bucket progresses to the next stage, the current tag can be pulled off and a new tag can be added. This procedure is not necessary for small catches but may be helpful when catches are large. Tags with commonly caught species names can also be temporarily attached to buckets to facilitate sorting and processing.

<u>Safe Handling of Organisms</u>

Field personnel are likely to encounter a variety of organisms that are potentially harmful. California scorpionfish (*Scorpaena guttata*) have venomous fin spines that can cause severe pain. This species should be handled with leather gloves and/or pliers. Hot water, meat tenderizer or ammonia should be applied to any puncture wound inflicted by this fish; heat is useful in breaking down the protein in the venom.

Several species of rockfishes and the spotted ratfish (*Hydrolagus colliei*) also have mildly venomous spines which can cause a burning sensation. The round sting ray (*Urobatis halleri*), the California butterfly ray (*Gymnura marmorata*), and the bat ray (*Myliobatis californica*) all have venomous spines on their tails.

The Pacific electric ray (*Torpedo californica*) can emit a very strong electric shock. If you must handle this species, wear rubber gloves and hold it by the tail. **Do not grasp the disk with both hands!**

Pacific angel sharks (*Squatina californica*), spiny dogfish (*Squalus acanthias*), spotted ratfish, Pacific electric rays, and California halibut (*Paralichthys californicus*) all have sharp teeth that can result in painful bites if they are not handled properly.

Care must also be taken in handling the blueleg mantis shrimp (*Hemisquilla ensigera*). This species is capable of severely cutting a person with its raptorial appendages. Care should also be taken in handling any of the large crabs and octopus.

Preservation of Specimens

Voucher specimens, incompletely identified fish and invertebrate specimens, and those with diseases that require further examination should be returned to the laboratory. Fish and invertebrate specimens may be preserved or documented for QC or identification purposes in one of three ways:

1) fixing in buffered formalin-seawater;
2) freezing;
3) photographing.

However, all such specimens should be fixed in buffered formalin-seawater unless they are absolutely too large for preservation in this manner in the field.

The preferred method for preserving small specimens is to fix them in 10% buffered formalin-seawater. Specimens with fin erosion, tumors, or lesions will be fixed in this manner. Buffered formalin is made by mixing 50 g Na_2B4O_7 (sodium borate) per liter of formaldehyde or 5 g per liter of 10% formalin. The body cavities of fish greater than 60 mm in length should be slit with a scalpel on the right (for most bilaterally symmetrical fish), the blind side (for flatfish), or ventral side (for dorsoventrally flattened fish, such as rays) before the specimen is placed in formalin. The slit allows preservative to enter the body cavity and preserve the internal organs. **Note that by convention, bilaterally symmetrical fish are photographed or drawn with their heads facing left and dissections or gut cavity incisions are conducted only on the right side of the fish.**

Fish and invertebrates will be placed in plastic bags or plastic jars and fixed in 10% buffered formalin-seawater. Fish should be inserted tail-first into jars so that they can be removed easily without destroying the fin rays or spines.

Fish should remain in formalin for no more than a week before being transferred to a freshwater bath. It is recommended that fish specimens soak in the water for at least two days. The water should be changed at least once during that period. The fish should then be transferred to a solution of 50% isopropanol (isopropyl alcohol), or 70% ethanol for preservation.

Trawl-caught invertebrates will also be fixed in 10% buffered formalin-seawater and preserved in 70% ethanol.
Voucher specimens should not be submitted to SCCWRP until they have been transferred to alcohol.

Larger specimens can be placed in plastic bags and frozen on dry ice if excessively large quantities of formalin would be required to fix the specimen in the field. These can then be thawed and fixed in the laboratory with a 10% buffered formalin solution. If possible, large specimens with tumors, fin erosion, or lesions should be fixed in the field with formalin rather than frozen. **Do not freeze specimens that can otherwise be preserved in the field in formalin-seawater.**

Small invertebrates (e.g., nudibranchs) may be kept cold in seawater and returned alive to the lab for identification.

Only large specimens of fish and invertebrates can be vouchered in the field by photographing them in color. If a photograph is used for a voucher of a species, it should show the overall appearance of the specimen, and all important identifying features. If characters necessary for the identification of a species cannot be seen in the photograph, the photograph will not be accepted as a voucher. Colorful fishes may also be photographed in addition to providing a preserved specimen to aid in identification of the voucher. Photographs of unidentified rockfishes, in particular, should be taken as soon as possible after capture because their color, which is an important taxonomic character, fades during preservation. Bilaterally symmetrical fish and dorsoventrally flattened fish (skates, rays) should be photographed facing left. Flatfish should be photographed with the eyed side up. The left-eyed species should be photographed facing to the left and the right-eyed species should face to the right (**Note:** The gill cover should cut the **lower** profile of the body). If an anomaly or important character occurs on the opposite side of the recommended profile for a particular type of fish, a photo should <u>also</u> be taken of the afflicted side. All specimens should be photographed on a light background with a meter stick along side and a label giving date, station number, and species in large bold letters. Notes should be made of character states that can aid in identification (e.g., counts of fin rays, gill rakers, and scales).

Specimens preserved for further identification must be noted on the field data sheet. Note whether the organism is fixed, frozen, or photographed. A photograph log should be kept during the survey, documenting species name, the frame number, the date and the station location of each photograph.

M. Fish Samples for Bioaccumulation/Biomarker StudiesError! Bookmark not defined.

Target Species

The geographic and depth range of the study precludes selecting a single species. The fish bioaccumulation study will utilize sanddab guild species for analysis of trace metals contamination. Target species include the following: speckled sanddab (*Citharichthys stigmaeus*); longfin sanddab (*Citharichthys xanthostigma*); Pacific sanddab (*Citharichthys sordidus*); gulf sanddab (*Citharichthys fragilis*); slender sole (*Lyopsetta exilis*); small (<20 cm) petrale sole (*Eopsetta jordani*), and small (<20 cm) juvenile California halibut (*Paralichthys californicus*);

Composites/Resampling

A sample composite will consist of six fish of a single species and age class of a sanddab-guild species (Table 3). Composites should be made for each age class of all sanddab guild species collected at a station, if at least six fish of an age class for each species is present.

TABLE 3. Age size classes (cm) for bioaccumulation target fish species.

Species	Age Class 0	Age Class 1	Age Class 2
speckled sanddab	5-7	8-10	11-16
longfin sanddab	5-8	9-13	14-16
gulf sanddab	5-7	8-10	11-14
Pacific sanddab	5-8	9-13	14-16
petrale sole (juv)	5-7	8-14	15-20
slender sole	5-8	9-10	11-12
California halibut (juv)	5-9	10-20	----

Bioaccumulation fish will be collected from the first trawl at a predetermined bioaccumulation station after the catch has been processed for assemblage data. If no individuals of the sanddab guild are encountered during the first trawl, no additional trawls will be required and the station will be abandoned. If six individuals of an age class of a species are collected during the first trawl, tissue sampling at that station is complete and no additional trawling is necessary.

If sanddab guild species are collected in the first trawl, but with fewer than six individuals in an age class, additional trawls will be required to complete an entire composite. If by the end of the third trawl (30 min total trawl time for all three attempts combined), an insufficient number of fish are collected for bioaccumulation or biomarkers, then no further trawl samples will be necessary and the station can be abandoned.

At the end of trawling at a station, all complete composites should be saved for all sanddab guild species (i.e. any age of any species with six fish). This will be done because the best combination of species and age classes for chemical analysis will not be known until the end of the survey. Incomplete composites will not be retained for analysis.

<u>Preservation</u>

Whole fish age-class composite samples for each species will be packaged in Ziploc plastic bags and placed on dry ice, or in a freezer. Fish samples (composites) will be recorded on the Trawl Cover Sheet (Appendix 6). A label including the agency name, date, station, species, age class and number collected should be placed in each bag and the bag should be labeled with the same information on the outside with a felt-tip marker. All the samples will be shipped to SCCWRP within one week of collection. It is recommended that SCCWRP (Darrin Greenstein, 714/372-9224) be contacted prior to delivery of samples so that arrangements can be made to transfer custody. A **completed chain of custody form** must accompany all shipments of samples (Appendix 6). Allow time for verification of the chain of custody.

N. Quality Assurance/Quality Control Procedures

In addition to the pre-survey QA/QC protocols, the following QC measures will check on the accuracy of taxonomic identifications and counts made during the survey:

1) During the survey, taxonomic identifications will be checked during at least one visit to each vessel by Bight'03 designated taxonomists. They will observe species identification by each organization in the field and record the data on a Taxonomy QA/QC Data Sheet (Appendix 7). Their duties include rechecking the identifications of at least 25% of the species collected during the day and noting any problems with the identification of pathologies. The Lead Scientist will be informed of any problems and the field personnel will be instructed regarding the appropriate identifications as needed. Each vessel will be expected to have appropriate taxonomic identification aids during the survey.
2) During the survey, QA/QC data will also be collected on variability in trawl data collection. On each survey day, the Cruise Leader (or delegate), will reprocess two randomly selected fish species (of at least 10 fish) that have already been counted, measured, and weighed. These species will be recounted, reweighed, and remeasured. A record of the counts, weights, and lengths of these quality control checks along with the original values will be maintained on a separate size class data sheet Bight'03 Demersal Fish, Quality Control Form and a note will be made in the trawl comments on the original trawl data sheet that the recount was taken (Appendix 6).

3) Voucher specimens of each species collected by each organization will be preserved and returned to SCCWRP during the survey (see Voucher Collection below). The identification of these specimens will be checked by a qualified

taxonomist following the survey to further ensure that identifications were made correctly. Errors in species identifications must be corrected in the data. Anomalies will be verified by a qualified pathologist.

O. Voucher Collection

The Bight'03 voucher collection of trawl organisms will be developed during the course of the survey and will be housed at SCCWRP. This collection will document the species taken during the survey and what names were applied to each. It will also document the types of diseases or anomalies found in the gross pathology examinations. Voucher specimens should be preserved in an appropriate manner and clearly labeled as to identity, collection date, site name, site location, and depth. It is also recommended that each organization develop a voucher collection at their organization. The voucher collection will consist of preserved organisms and photographs of organisms.

Each organization will be provided with a list of trawl fish and invertebrate species. For every species caught, each organization will provide at least one representative of that species to the Bight'03 voucher collection. Thus for many species, the Bight'03 voucher collection will contain representatives from all organizations involved in data collection. As species are collected, they will be checked off the list. Each organization will give specimens to the Bight'03 voucher collection before including them in their own collection.

Specimens requiring further identification should be identified by the collecting organization and data should be corrected as appropriate on the field data sheet. Do not submit such specimens to SCCWRP unless the specimens cannot be identified by taxonomists at that organization. Any particular specimen in an organization's voucher collection will represent organisms with the same name that have been collected during Bight'03. Thus it is very important that all specimens be correctly identified.

X. LABELING AND SHIPPING OF SAMPLES AND FIELD DATA SHEETS

A. Sample Labels/Tracking

Each sample will be identified and tracked by the station, parameter, date sampled, and split number if required. Individual log numbers may be used at the discretion of the sampling organization. Sample log numbers will be handled by SCCWRP for the samples shipped to SCCWRP that are not run by the organization that collected them in the field.

B. Labels

Labels will be printed by the organization responsible for field sampling prior to the survey and will include, at a minimum, the station number, parameter, date, and split (i.e., 1 of 1, 2 of 3, etc.). Dates will be reported as day/month/year. External labels should be covered with clear postal tape to prevent them from falling off the container if they will not stick on some surfaces.

C. Field Data Sheets

If a field computer has not been used during any part of the Bight'03 sampling, then benthic data sheets and cruise logs will be retained by the sampling organization until sampling is completed. Trawl data sheets will be returned to the organization's laboratory and held there until all species identifications are complete. Data on species identified in the laboratory must be added to the data sheets and verified within the laboratory. Upon completion of laboratory identifications, copies of the field data sheets will be sent to SCCWRP with the originals retained by the sampling organization. Trawl fish and invertebrate data will be submitted electronically and as hardcopies to SCCWRP as soon as the data sheets are complete.

D. Shipping of Samples

All sediment chemistry, tissue, and toxicity samples not analyzed by the field sampling organization's laboratory will be shipped to SCCWRP within the prescribed holding time. All shipping of samples will be the responsibility of the field sampling organizations. See Appendix 9 for detailed SCCWRP shipping information.

Voucher collections will be shipped to SCCWRP at some point after an organization has completed trawling and the specimens have been properly preserved.

E. Chain of Custody Forms

Chain of custody forms (Appendix 6) are to be filled out at the end of each sampling day detailing the transfer of samples from the vessel crew to the laboratory, or to delivery personnel. A form is to be filled out for each set of samples that will be transferred to a specific location. The sample and container type is to be included on the form to identify the samples being transferred. This form is to be signed by the crew member transferring the samples and the laboratory staff member receiving them. A copy of the form is to be kept and the original form with signatures will accompany the samples. If samples are shipped by carrier, a copy of the chain of custody form is to be faxed to SCCWRP for tracking purposes.

XI. CONTINGENCY PLANS

A. Purpose

Any field program can be affected by factors outside the control of the sampling crews. Weather, equipment failure, errors in designating station locations, and accidents can all prevent the field crews from obtaining samples at one or more stations. Contingency plans made in advance of the survey can greatly facilitate decision-making in the field. It is the responsibility of the Cruise Leader to make most of these decisions in the field, based on the protocol described below. If there is any question regarding which protocol to follow, the Field Coordinator should be notified immediately.

B. Adverse Weather Conditions

In the event that the weather conditions deteriorate during any sampling day, it is the responsibility of both the Boat Captain and the Cruise Leader to determine if the conditions are sufficiently bad to prevent further sampling. The Cruise Leader should evaluate all alternatives, such as changing the sampling plan to more protected areas or returning to the prescribed schedule when the weather improves. Every attempt should be made to avoid wasting the entire day. However, **the safety of the crew is the number one priority.**

C. Station Inaccessibility

Stations can be inaccessible because 1) they were incorrectly positioned on land, 2) they were located in water too shallow for the boat, or 3) they cannot be sampled for unforeseen circumstances. If it cannot be sampled, the sampling site will be moved to a location within 100 m horizontal distance from the original site, staying within +/-10% of the depth of the original site. If it still cannot be sampled, the station will be abandoned. No station should be sampled in less than 5 m (3 m for bays and harbors; < 0.5 m for estuaries) or more than 1000 m.

D. Lost Gear

Lost gear can potentially have a significant effect on the sampling program. Equipment can be expensive and replacements may not be obtained in a timely manner. Crews should take every precaution against the loss of gear by properly tightening shackles and other connectors.

If important gear is lost, notify the Boat Captain immediately, so he can record the position using the vessel's navigation system. If possible, deploy a buoy at that exact location so relocation is made easier. Attempt to recover the equipment for a reasonable amount of time. If unsuccessful, use spare equipment (when available) or continue sampling without that particular equipment and/or notify the Field Coordinator.

XII. WASTE DISPOSAL

Proper disposal of all waste is an important component of field activities. At no time will any waste be disposed of improperly. The proper methods of waste disposal are outlined below:

A. Routine Garbage

Regular garbage (paper towels, paper cups, etc.) is placed in trash containers on board the boats. It can then be disposed on land in public receptacles or recycled.

B. Detergent Washes

Biodegradable detergents are recommended for cleaning the Van Veen grab, or deck surfaces.

C. Chemicals

Acetone, formalin, hexane and methylene chloride are hazardous materials and should be disposed of by following all appropriate hazardous materials regulations. They should never be disposed at sea.

D. Fish Waste

After each trawl catch has been processed completely, the remaining catch should be disposed of at sea. Use discretion when discarding the catch. For sampling conducted nearshore or in bays and harbors, return only live fish and invertebrates to the area where trawling occurred. All of the remaining fish should be disposed of offshore. Under no circumstances should fish be given to the public.

XIII. BIGHT'03 PROGRAM ORGANIZATION

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IV. LITERATURE CITED

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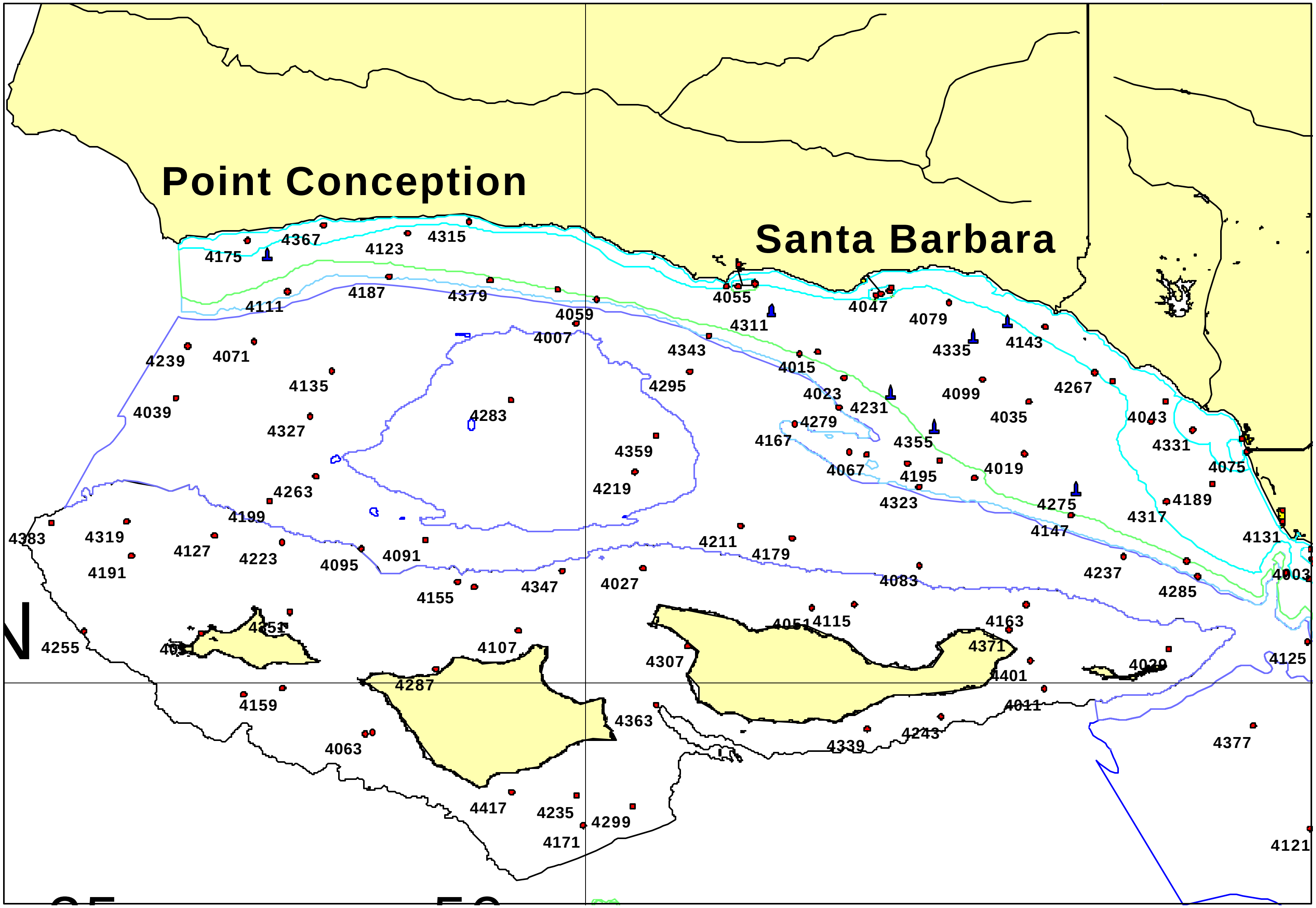
APPENDICES

APPENDIX 1

Bight'03 Station Location Charts

Bight' 03 Sampling Stations



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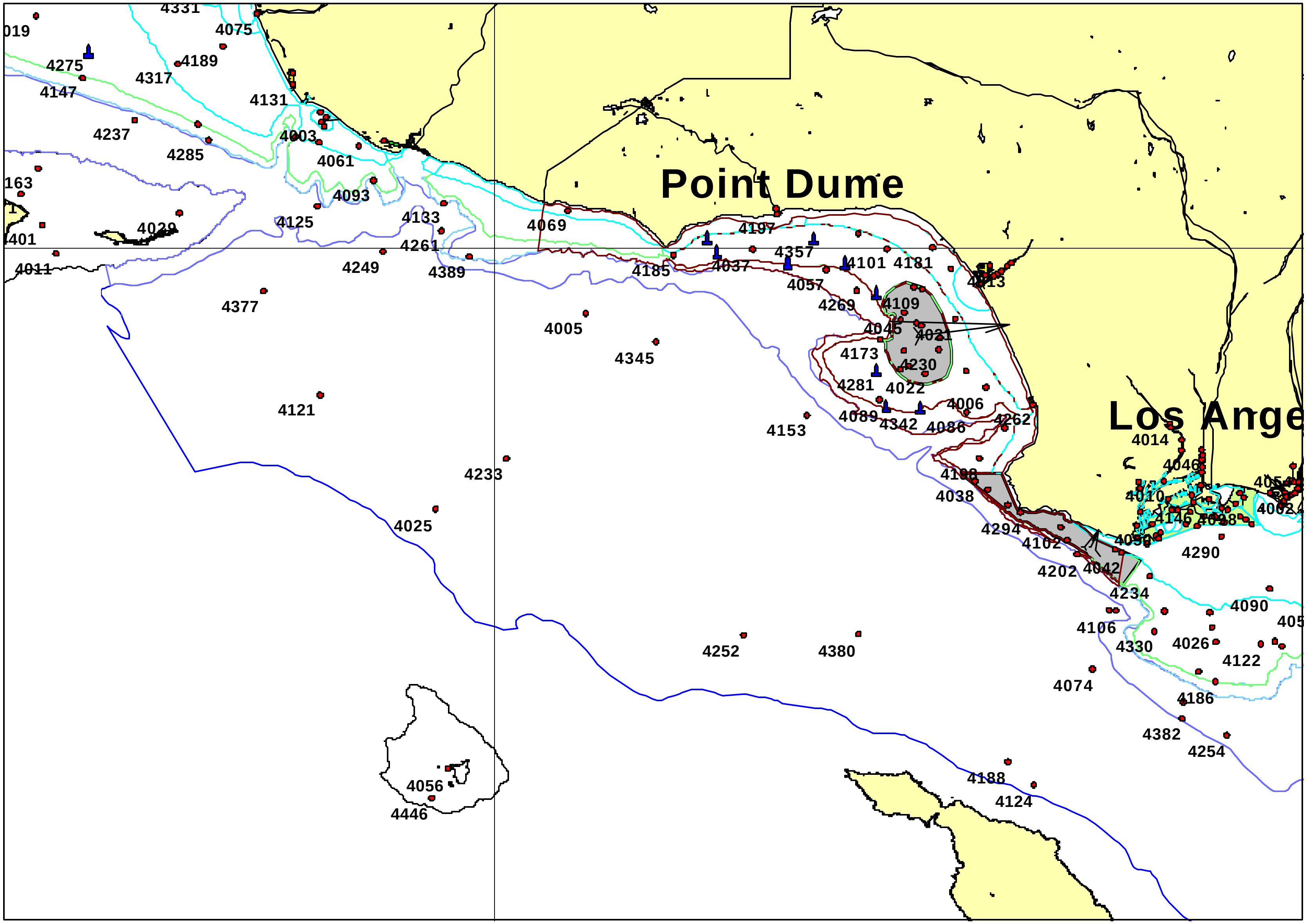

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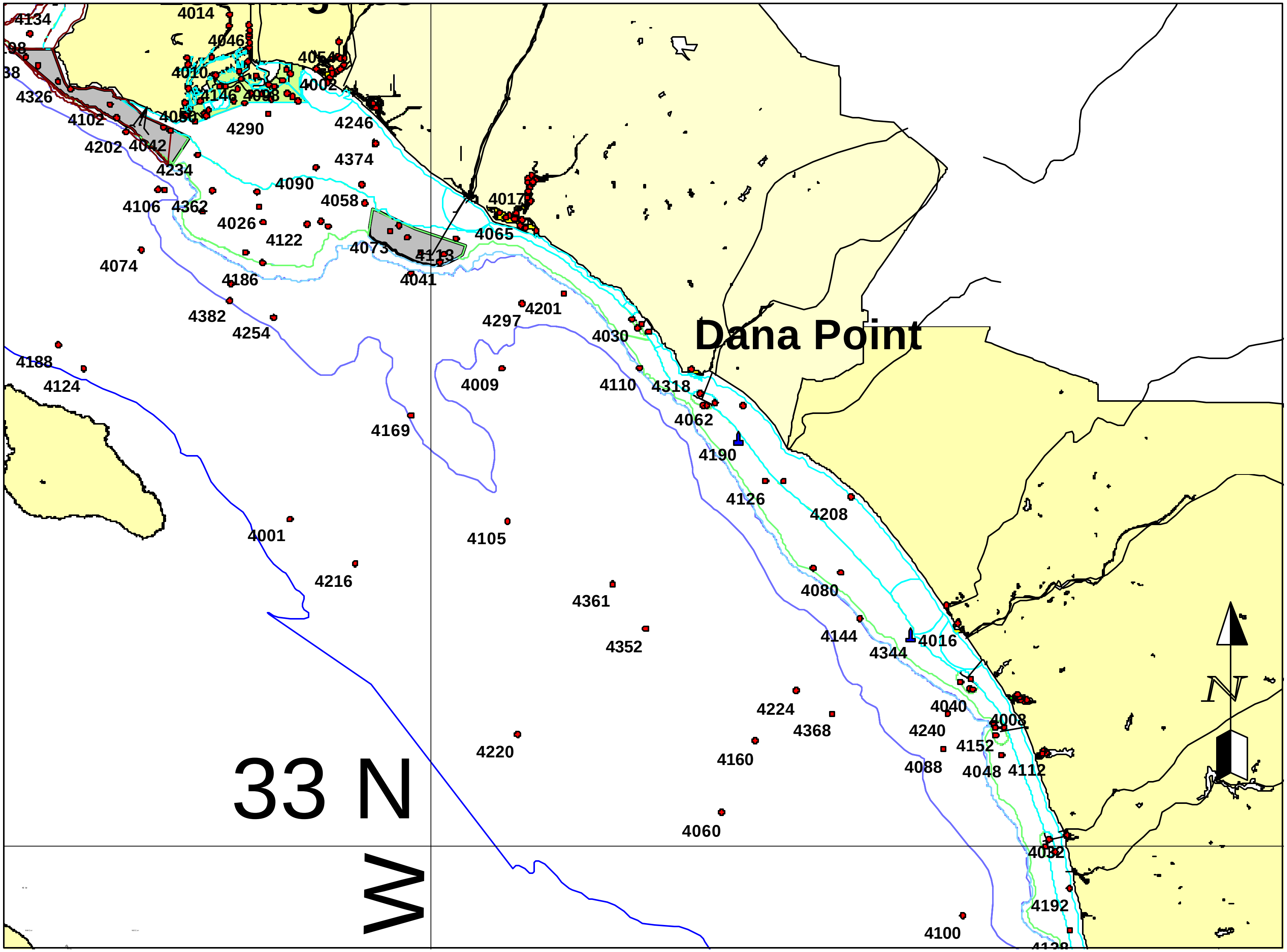

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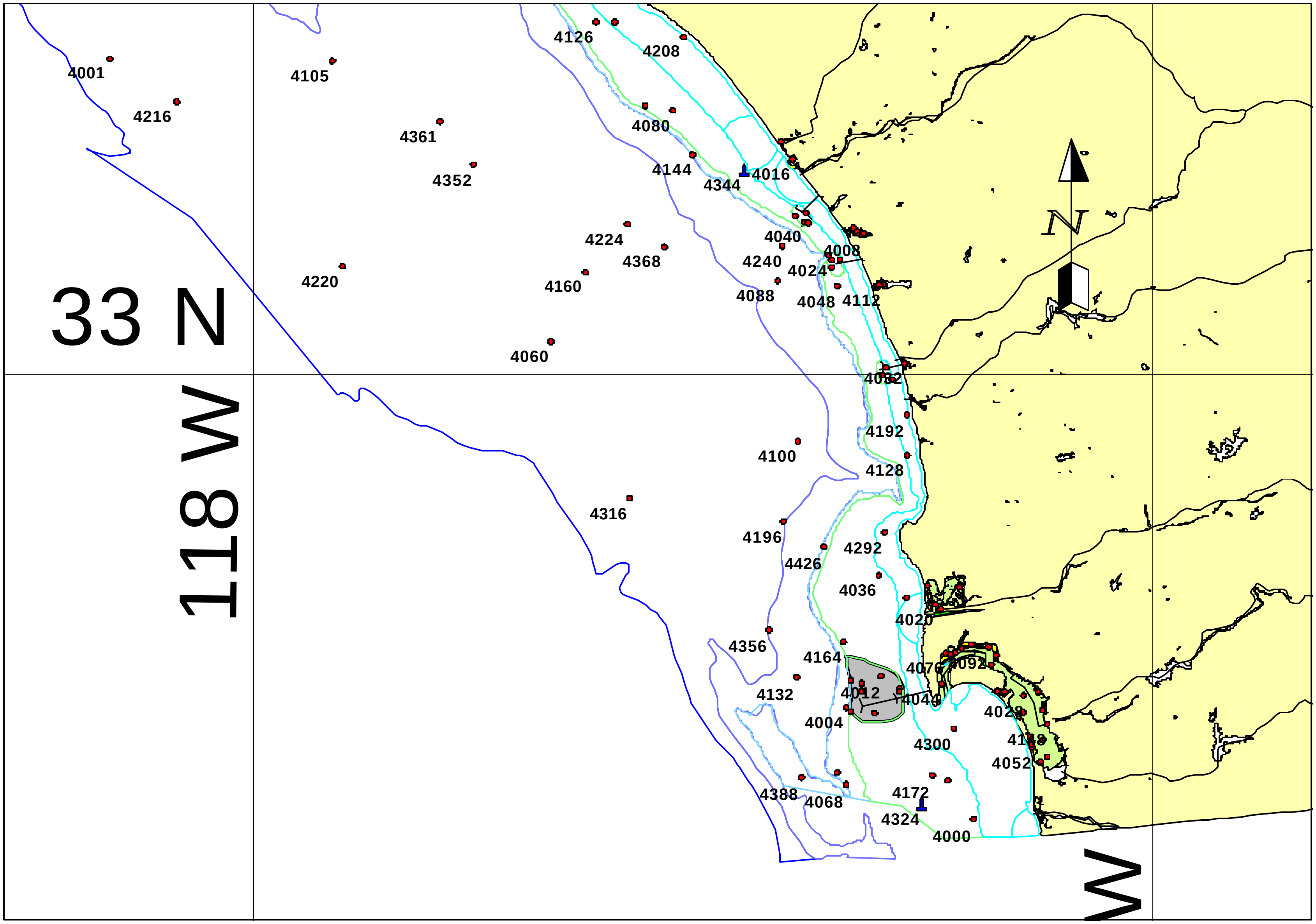

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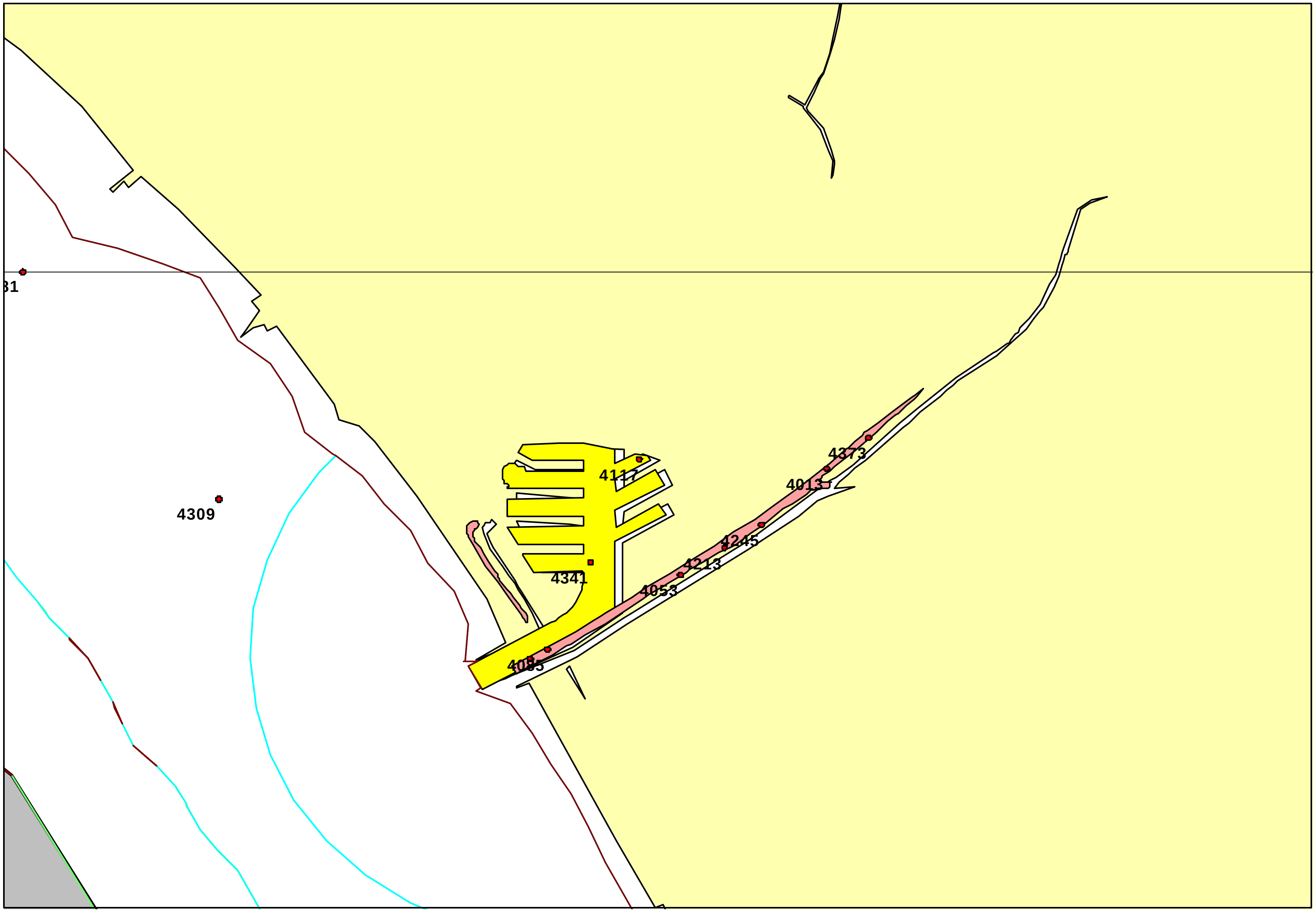

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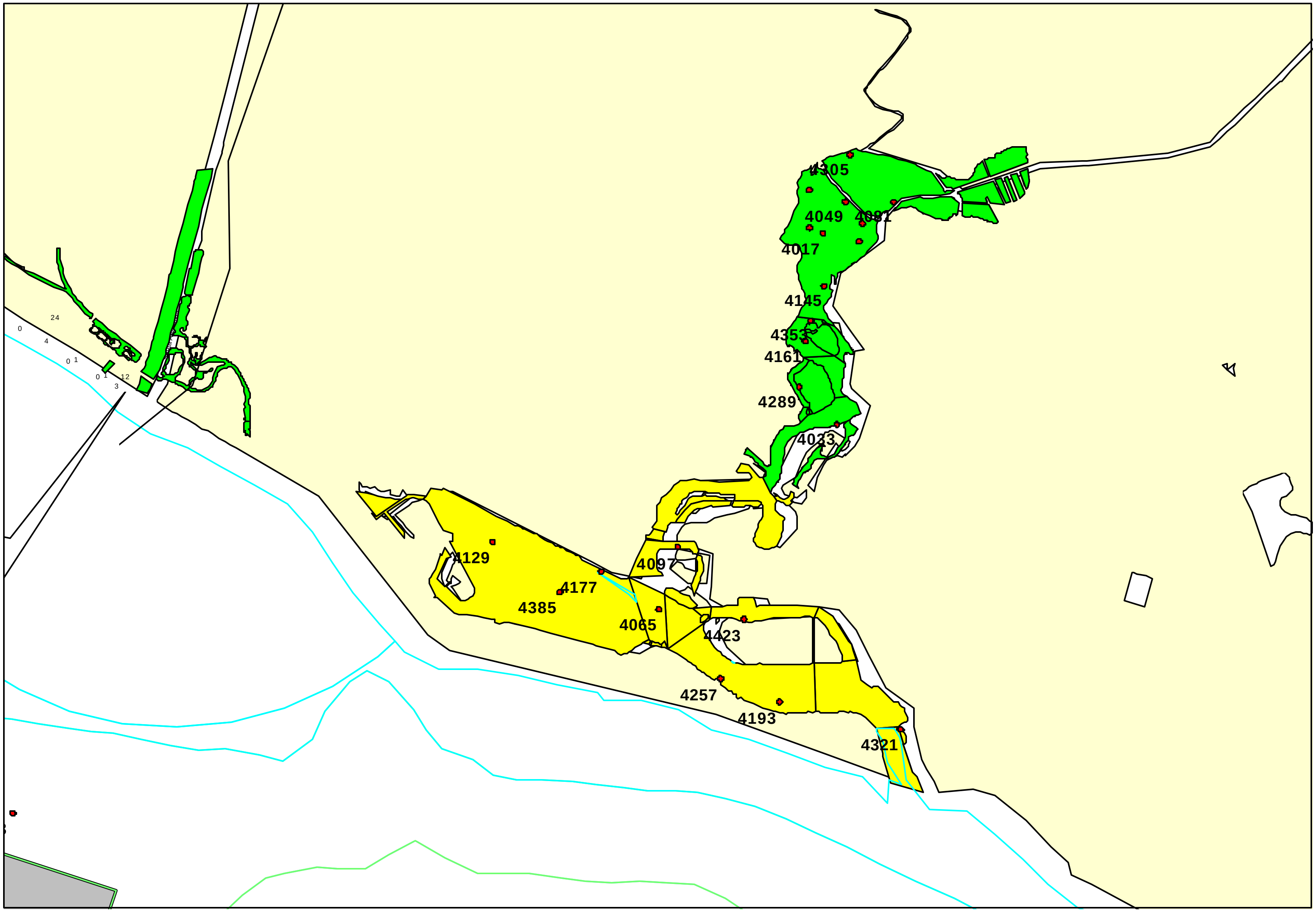
Bight' 03 Sampling Stations



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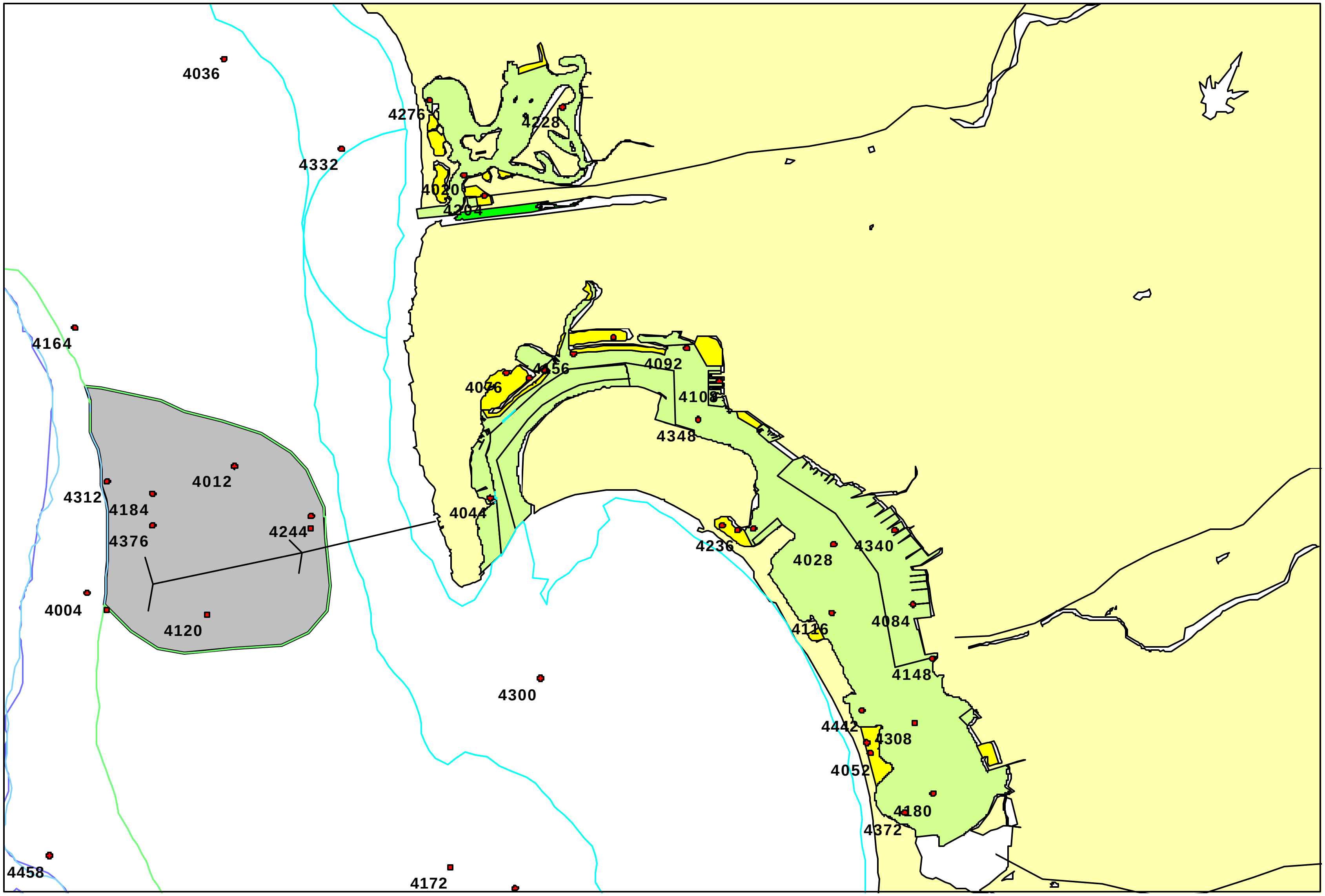

APPENDIX 2

Bight'03 Field Sampling Organizations

and station Draw Information

LEGEND TO BIGHT '03 SAMPLING ORGANIZATIONS

ABC = Aquatic Bioassay & Consulting Laboratories
CINMS = Channel Islands National Marine Sanctuary
HY = City of Los Angeles Bureau of Sanitation (Hyperion Treatment Plant)
LA = Los Angeles County Sanitation District
MBC = MBC Applied Environmental Sciences
MEC = MEC Analytical Systems, Inc.
OC = Orange County Sanitation District
SD = City of San Diego, Metropolitan Wastewater Department
SV = SeaVentures
VRG = Van Tuna Research Group
NA = Not Assigned

The station draw information is as complete as was available on July 2, 2003. The Estuary draw has not been included in the following information, but will be forthcoming and subsequently released as and separate addendum. If any additional updates become necessary, addenda will be compiled and notification will be issued.

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4000	SD	SD	32 33.0486	117 11.9586	X	X	X	X	X
4001	CINMS	NA	33 19.0500	118 09.6054		X			
4003	ABC	ABC	34 07.5042	119 11.5608	X	X		X	X
4004	SD	SD	32 39.7926	117 20.4738	X	X	X	X	X
4005	CINMS	NA	33 56.0448	118 53.7930		X			
4006	HY	VRG-C	33 51.6228	118 26.8830	X	X	X	X	X
4007	MBC	ABC-C	34 21.7608	120 00.6204	X	X	X	X	
4009	CINMS	NA	33 27.8508	117 55.1484		X			
4010	HY		33 46.0080	118 14.9454	X	X	X	X	
4011	CINMS	CINMS	33 59.6298	119 29.3988	X	X	X	X	
4012	SD	SD	32 41.6880	117 18.1362	X	X		X	X
4013	ABC	NA	33 58.8810	118 25.4640	X	X	X		
4015	ABC	ABC	34 20.0286	119 44.5032	X	X	X	X	X
4016	MEC-C	MEC-C	33 12.9696	117 24.0516	X	X	X	X	
4018	MEC-C	VRG-C	33 45.3216	118 07.7922	X	X	X	X	
4019	ABC	ABC	34 13.8606	119 30.7320	X	X	X	X	X
4020	SD	SD	32 46.0494	117 14.4960	X	X	X	X	
4021	HY	VRG-C	33 55.7202	118 28.9692	X	X	X	X	X
4022	HY	VRG-C	33 52.4262	118 30.9924	X	X		X	X
4023	MBC	MBC	34 18.4704	119 42.7602	X	X	X	X	X
4024	MEC	MEC	33 07.1610	117 21.6372	X	X		X	X
4025	CINMS	NA	33 44.3334	119 03.8880		X			
4026	LA	LA	33 37.2630	118 11.7042	X	X	X	X	X
4027	CINMS	CINMS	34 06.9360	119 56.1696	X	X	X	X	
4028	SD	SD	32 40.5222	117 08.6310	X	X	X	X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4029	CINMS	CINMS	34 02.0502	119 21.0960	X	X	X	X	
4030	OC	OC	33 30.7092	117 46.2798	X	X		X	X
4031	CINMS	CINMS	34 03.0012	120 25.6332	X	X	X	X	
4035	ABC	ABC	34 17.0154	119 30.4284	X	X	X	X	X
4036	SD	SD	32 47.7870	117 18.2994	X	X	X	X	X
4037	HY	HY	33 59.8896	118 42.5724	X	X	X	X	X
4038	LA	LA	33 46.0092	118 27.6288	X	X		X	X
4039	MBC	ABC-C	34 17.2266	120 27.3342	X	X	X	X	
4040	MEC	MEC-C	33 9.1668	117 23.2452	X	X		X	X
4041	OC	OC	33 34.0422	117 59.3772	X	X		X	X
4042	LA	LA	33 41.7246	118 17.7696	X	X		X	X
4043	ABC	ABC	34 17.0394	119 21.2946	X	X	X	X	X
4044	SD	SD	32 41.2134	117 14.0838	X	X	X	X	
4045	HY	HY	33 56.0916	118 32.3856	X	X		X	X
4047	ABC	ABC	34 23.7288	119 39.7308	X	X		X	X
4048	MEC	MEC-C	33 05.2842	117 21.0588	X	X	X	X	X
4050	HY	HY	33 43.4496	118 15.7296	X	X	X	X	
4051	CINMS	CINMS	34 04.5240	119 44.9118	X	X	X	X	
4052	SD	SD	32 37.3932	117 08.0490	X	X	X	X	
4053	ABC	NA	33 58.2804	118 26.3754	X	X	X		
4055	ABC	ABC	34 24.2370	119 48.7266	X	X		X	X
4056	CINMS	CINMS	33 28.8120	119 03.0624	X	X	X	X	
4057	HY	HY	33 58.6644	118 37.6272	X	X	X	X	X
4058	OC	OC	33 38.5800	118 04.7010	X	X	X	X	X
4059	MBC	MBC	34 23.2170	119 59.2692	X	X	X	X	X

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4060	CINMS	NA	33 01.9452	117 40.1544		X			
4061	ABC	ABC	34 06.0672	119 09.0492	X	X	X	X	X
4062	SV	SV	33 25.8426	117 40.6050	X	X		X	X
4063	CINMS	CINMS	33 56.8980	120 14.7144	X	X	X	X	
4064	MEC	MEC-C	33 00.3678	117 17.7996	X	X		X	X
4065	OC	OC	33 36.5640	117 54.2856	X	X	X	X	
4067	MBC	MBC	34 13.8096	119 41.2464	X	X	X	X	X
4068	SD	SD	32 35.1402	117 20.4660	X	X	X	X	X
4069	HY	HY	34 02.1978	118 55.0110	X	X	X	X	X
4070	LA	LA	33 45.5118	118 26.7786	X	X		X	X
4071	MBC	ABC-C	34 20.6544	120 22.1166	X	X	X	X	
4073	OC	OC	33 35.8608	118 02.7678	X	X		X	
4074	CINMS	NA	33 34.7574	118 19.7328		X			
4075	ABC	NA	34 13.9836	119 15.9018	X	X	X		
4076	SD	SD	32 43.0860	117 13.8276	X	X	X	X	
4077	HY	HY	33 55.3182	118 31.2318	X	X		X	
4079	ABC	ABC	34 23.0142	119 35.7462	X	X	X	X	
4080	MEC	MEC-C	33 15.9318	117 32.0358	X	X	X	X	
4083	MBC	ABC-C	34 07.0926	119 37.7346	X	X	X	X	
4084	SD	SD	32 39.6198	117 07.3752	X	X	X	X	
4085	ABC	NA	33 57.8580	118 27.2070	X	X	X		
4086	HY	VRG-C	33 50.1276	118 28.1892	X	X	X	X	
4088	MEC	MEC-C	33 05.6250	117 25.0290	X	X	X	X	
4089	HY	VRG-C	33 50.8776	118 34.0728	X	X	X	X	
4090	LA	LA	33 39.5736	118 07.8390	X	X	X	X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4091	MBC	ABC-C	34 08.6274	120 10.6932	X	X	X	X	
4092	SD	SD	32 43.4562	117 10.9656	X	X	X	X	
4093	ABC	ABC	34 03.9960	119 08.0640	X	X	X	X	
4094	SV	SV	33 26.3802	117 41.6316	X	X		X	
4095	CINMS	CINMS	34 08.1084	120 14.9664	X	X	X	X	
4096	MEC	MEC-C	33 16.1946	117 33.8910	X	X	X	X	
4097	OC	OC	33 36.9126	117 54.1692	X	X	X	X	
4098	HY	HY	33 44.6520	118 10.1202	X	X	X	X	
4099	ABC	ABC	34 18.3816	119 33.5148	X	X	X	X	
4100	CINMS	NA	32 55.9080	117 23.6898		X			
4101	HY	HY	33 59.8956	118 33.5550	X	X	X	X	
4102	LA	LA	33 43.2456	118 21.8778	X	X		X	
4103	MBC	MBC	34 13.9674	119 42.4086	X	X	X	X	
4105	CINMS	NA	33 18.9174	117 54.7584		X			
4106	CINMS	NA	33 38.2704	118 18.1650		X			
4107	CINMS	CINMS	34 03.1410	120 04.4892	X	X	X	X	
4108	SD	SD	32 42.9588	117 10.4424	X	X	X	X	
4109	HY	HY	33 57.5184	118 31.1856	X	X		X	
4110	OC	OC	33 27.8664	117 45.7476	X	X		X	
4111	MBC	MBC	34 23.6814	120 19.8882	X	X		X	
4113	OC	OC	33 35.4216	117 58.2690	X	X		X	
4114	HY	HY	33 42.2538	118 16.0800	X	X	X	X	
4115	CINMS	CINMS	34 04.7376	119 42.0714	X	X	X	X	
4116	SD	SD	32 39.4968	117 08.6604	X	X	X	X	
4117	ABC	ABC	33 58.9350	118 26.6358	X	X	X	X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4119	ABC	ABC	34 23.9958	119 50.5998	X	X		X	
4120	SD	SD	32 39.4716	117 18.5712	X	X		X	
4121	CINMS	NA	33 51.1554	119 11.6526		X			
4122	LA	LA	33 36.2652	118 08.4282	X	X		X	
4123	ABC	ABC	34 27.2202	120 11.8488	X	X		X	
4124	CINMS	NA	33 27.8322	118 23.6808		X			
4125	MBC	ABC-C	34 02.4684	119 11.8326	X	X	X	X	
4126	SV	MEC-C	33 21.2784	117 37.1604	X	X		X	
4127	CINMS	CINMS	34 08.9118	120 24.7656	X	X	X	X	
4128	SD	SD	32 55.0542	117 16.3956	X	X		X	
4129	OC	OC	33 36.9414	117 55.3104	X	X	X	X	
4131	ABC	ABC	34 09.7434	119 13.4916	X	X	X	X	
4132	SD	MEC-C	32 41.6310	117 23.7492	X	X	X	X	
4133	ABC	ABC	34 02.6436	119 03.3348	X	X		X	
4134	LA	LA	33 49.1904	118 25.6272	X	X		X	
4135	MBC	ABC-C	34 18.8670	120 16.9410	X	X	X	X	
4137	OC	OC	33 34.6146	118 00.6960	X	X		X	
4138	HY	HY	33 43.3506	118 16.7628	X	X	X	X	
4139	ABC	ABC	34 14.7696	119 16.2084	X	X	X	X	
4140	SD	SD	32 43.0098	117 13.4574	X	X	X	X	
4141	HY	HY	33 55.4748	118 31.5732	X	X		X	
4143	ABC	ABC	34 21.5394	119 29.3310	X	X		X	
4144	MEC	MEC-C	33 13.2414	117 30.7212	X	X		X	
4146	HY	HY	33 44.7330	118 12.9450	X	X	X	X	
4147	MBC	MBC	34 10.1316	119 27.6138	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4148	SD	SD	32 38.8080	117 07.0680	X	X	X	X	
4149	ABC	NA	33 57.8064	118 27.3162	X	X	X		
4150	HY	VRG-C	33 52.6134	118 28.2204	X	X		X	
4151	ABC	ABC	34 19.9260	119 45.7212	X	X		X	
4152	MEC	MEC	33 06.8796	117 21.4572	X	X		X	
4153	CINMS	NA	33 49.9458	118 38.9286		X			
4154	OC	OC	33 37.4928	118 04.5138	X	X		X	
4155	CINMS	CINMS	34 06.0978	120 08.5434	X	X	X	X	
4156	SD	SD	32 43.3728	117 12.7578	X	X	X	X	
4157	ABC	ABC	34 06.6234	119 13.2960	X	X		X	
4158	SV	MEC-C	33 25.6704	117 38.6910	X	X		X	
4159	CINMS	CINMS	33 59.6766	120 20.2416	X	X	X	X	
4160	CINMS	NA	33 06.1194	117 37.8552		X			
4162	HY	HY	33 43.8708	118 11.5152	X	X	X	X	
4163	CINMS	CINMS	34 04.7256	119 30.6030	X	X	X	X	
4164	SD	SD	32 43.7622	117 20.6670	X	X		X	
4165	HY	HY	34 00.8322	118 35.4924	X	X		X	
4166	LA	LA	33 42.4716	118 21.4326	X	X		X	
4167	MBC	MBC	34 15.6672	119 46.0404	X	X		X	
4169	OC	OC	33 25.1070	118 01.3506	X	X	X	X	
4170	LA	LA	33 41.9106	118 18.2298	X	X		X	
4171	CINMS	CINMS	33 51.3426	120 00.1638	X	X	X	X	
4172	SD	SD	32 35.6922	117 14.7108	X	X		X	
4173	HY	VRG-C	33 54.4698	118 34.0176	X	X		X	
4175	ABC	ABC	34 26.7774	120 22.5576	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4177	OC	OC	33 36.7776	117 54.6402	X	X	X	X	
4178	HY	NA	33 42.7230	118 15.4734	X	X	X		
4179	MBC	ABC-C	34 08.7372	119 46.2054	X	X	X	X	
4180	SD	NA	32 36.7908	117 07.0536	X	X	X		
4181	HY	HY	33 59.9946	118 30.4842	X	X		X	
4183	ABC	ABC	34 23.9934	119 49.8312	X	X		X	
4184	SD	SD	32 41.2764	117 19.4364	X	X		X	
4185	HY	HY	33 59.5248	118 47.8974	X	X		X	
4186	LA	LA	33 34.0140	118 11.4822	X	X			
4187	MBC	MBC	34 24.5988	120 13.1232	X	X		X	
4188	CINMS	NA	33 29.2110	118 25.4124		X			
4189	ABC	ABC	34 12.0390	119 18.1770	X	X		X	
4190	NA	NA	33 23.7930	117 38.9952					
4191	CINMS	CINMS	34 07.6734	120 30.2916	X	X	X	X	
4192	MEC	MEC-C	32 57.5076	117 16.4106	X	X		X	
4193	OC	NA	33 36.0450	117 53.5416	X	X	X		
4195	MBC	MBC	34 13.4484	119 36.3798	X	X		X	
4196	CINMS	NA	32 51.0576	117 24.6408		X			
4198	LA	LA	33 47.3814	118 27.3474	X	X			
4199	MBC	ABC-C	34 10.9902	120 21.0774	X	X	X	X	
4200	MEC	MEC-C	33 09.5454	117 23.8566	X	X		X	
4201	OC	OC	33 32.2116	117 50.9088	X	X	X	X	
4202	LA	LA	33 41.6454	118 20.7906	X	X	X	X	
4203	ABC	ABC	34 15.8316	119 22.2618	X	X		X	
4204	SD	NA	32 45.7380	117 14.1708	X	X	X		

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4205	HY	HY	33 55.6710	118 32.6256	X	X		X	
4207	ABC	ABC	34 23.9460	119 39.6042	X	X		X	
4208	MEC	MEC-C	33 20.3592	117 31.3314	X	X		X	
4210	HY		33 45.1644	118 13.0638	X	X	X		
4211	MBC	ABC-C	34 09.5016	119 49.6578	X	X	X	X	
4212	SD	NA	32 37.5516	117 08.1084	X	X	X		
4213	ABC	NA	33 58.4340	118 26.1030	X	X	X		
4214	NA	NA	33 50.5092	118 33.6042					
4215	ABC	ABC	34 24.1470	119 48.7188	X	X		X	
4216	CINMS	NA	33 16.4502	118 05.1528		X			
4217	NA	NA	33 59.0910	118 40.2204					
4218	LA	LA	33 36.4302	118 07.4772	X	X			
4219	CINMS	NA	34 12.7554	119 56.7252		X			
4220	CINMS	NA	33 06.4956	117 54.0756		X			
4221	ABC	NA	34 06.3900	119 07.3434	X	X	X		
4222	SV	SV	33 25.6920	117 41.4210	X	X		X	
4223	CINMS	CINMS	34 08.5014	120 20.2554	X	X	X	X	
4224	CINMS	NA	33 09.0486	117 35.0724		X			
4226	HY		33 45.0504	118 09.5658	X	X	X		
4227	MBC	MBC	34 12.4062	119 34.0488	X	X		X	
4228	SD	NA	32 47.0634	117 12.9300	X	X	X		
4229	NA	NA	33 59.0790	118 36.3354					
4230	HY	HY	33 53.8758	118 30.0804	X	X		X	
4231	NA	NA	34 17.5878	119 39.6474					
4232	MEC	MEC	33 06.4350	117 21.4434	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4233	CINMS	NA	33 47.3574	118 59.1432		X			
4234	LA	LA	33 40.3074	118 15.8868	X	X			
4235	CINMS	CINMS	33 53.1906	120 00.6048	X	X	X	X	
4236	SD	NA	32 40.7334	117 10.1550	X	X	X		
4237	MBC	ABC-C	34 07.6326	119 24.1080	X	X	X	X	
4238	OC	OC	33 29.9850	117 45.1266	X	X		X	
4239	MBC	ABC-C	34 20.3796	120 26.5338	X	X	X	X	
4240	MEC	MEC-C	33 07.7046	117 24.7218	X	X	X	X	
4241	OC	OC	33 36.1770	118 02.1612	X	X		X	
4242	HY	NA	33 43.4526	118 13.4538	X	X	X		
4243	CINMS	CINMS	33 57.9408	119 36.2892	X	X	X	X	
4244	SD	SD	32 40.9458	117 16.9182	X	X		X	
4245	ABC	NA	33 58.5636	118 25.8714	X	X	X		
4247	ABC	ABC	34 23.5584	119 40.2882	X	X		X	
4248	SD	SD	32 40.7604	117 16.9272	X	X		X	
4249	CINMS	NA	33 59.7570	119 07.4268		X			
4250	LA	LA	33 34.6128	118 12.6168	X	X			
4251	MBC	MBC	34 23.8170	120 01.8630	X	X		X	
4252	CINMS	NA	33 36.7920	118 43.1850		X			
4253	ABC	ABC	34 07.2204	119 11.3772	X	X		X	
4254	LA	LA	33 30.8088	118 10.7178	X	X	X	X	
4255	CINMS	CINMS	34 03.1146	120 33.4812	X	X	X	X	
4256	SD	SD	32 35.3730	117 13.6860	X	X		X	
4257	OC	NA	33 36.1758	117 53.9058	X	X	X		
4259	ABC	ABC	34 08.1042	119 11.6286	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4260	SD	SD	32 39.5310	117 20.1594	X	X		X	
4261	HY	HY	34 00.9936	119 03.4998	X	X	X	X	
4262	LA	NA	33 50.5830	118 23.7474	X	X	X		
4263	MBC	ABC-C	34 12.4974	120 17.9928	X	X	X	X	
4265	OC	OC	33 35.4882	118 01.5954	X	X		X	
4266	HY	HY	33 45.9738	118 16.6392	X	X	X	X	
4267	ABC	ABC	34 18.7794	119 26.0082	X	X		X	
4268	SD	NA	32 43.1208	117 13.2018	X	X	X		
4269	HY	HY	33 57.4266	118 35.5818	X	X		X	
4271	NA	NA	34 21.8922	119 31.8480					
4274	HY		33 43.7142	118 09.4332	X	X	X		
4275	NA	NA	34 11.7540	119 27.2424					
4276	SD	NA	32 47.1672	117 15.0390	X	X	X		
4277	HY	HY	33 54.5760	118 29.9802	X	X		X	
4278	HY	VRG-C	33 52.6842	118 32.6544	X	X		X	
4279	MBC	MBC	34 16.6686	119 43.0962	X	X	X	X	
4280	MEC	MEC	33 06.8886	117 20.8860	X	X		X	
4281	NA	NA	33 52.6824	118 34.2462					
4282	LA	LA	33 38.1468	118 11.8638	X	X			
4283	CINMS	NA	34 17.1234	120 04.9794		X			
4284	SD	NA	32 43.6152	117 12.1236	X	X	X		
4285	MBC	MBC	34 06.4302	119 19.1412	X	X		X	
4286	OC	OC	33 30.2010	117 45.8988	X	X		X	
4287	CINMS	CINMS	34 00.8106	120 10.0074	X	X	X	X	
4290	LA	LA	33 42.6996	118 11.0754	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4291	ABC	ABC	34 18.2730	119 24.8226	X	X		X	
4292	SD	SD	32 50.3916	117 17.8938	X	X		X	
4294	LA	LA	33 44.1438	118 24.5814	X	X		X	
4295	MBC	ABC-C	34 18.8280	119 53.0526	X	X	X	X	
4296	MEC	MEC-C	33 09.1164	117 22.9992	X	X		X	
4297	OC	OC	33 31.6224	117 53.7660	X	X	X	X	
4298	CINMS	NA	33 38.2800	118 18.6048		X			
4299	CINMS	CINMS	33 52.4832	119 56.8656	X	X	X	X	
4300	SD	SD	32 38.5164	117 13.2822	X	X		X	
4301	HY	HY	33 53.8086	118 32.4138	X	X		X	
4303	NA	NA	34 25.9746	120 21.2238					
4306	HY	NA	33 44.3004	118 14.0046	X	X	X		
4307	CINMS	CINMS	34 2.2170	119 53.1840	X	X	X	X	
4308	SD	NA	32 37.8480	117 07.3452	X	X	X		
4309	HY	HY	33 58.7082	118 29.2584	X	X		X	
4311	NA	NA	34 22.5426	119 47.6034					
4312	SD	SD	32 41.4564	117 20.1570	X	X		X	
4313	NA	NA	33 59.7408	118 44.9610					
4314	LA	LA	33 36.3828	118 11.4414	X	X			
4315	ABC	ABC	34 27.9174	120 07.7766	X	X		X	
4316	CINMS	NA	32 52.4472	117 34.9248		X			
4317	ABC	ABC	34 10.9656	119 21.2190	X	X		X	
4318	SV	NA	33 27.7938	117 42.2292	X	X	X		
4319	CINMS	CINMS	34 09.7638	120 30.6222	X	X	X	X	
4320	MEC	MEC-C	32 59.6322	117 17.4030	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4321	OC	NA	33 35.8914	117 52.7964	X	X	X		
4323	MBC	MBC	34 11.8656	119 37.7490	X	X		X	
4324	NA	NA	32 33.9864	117 15.4548					
4325	NA	NA	34 00.5826	118 45.6468					
4326	LA	LA	33 44.5812	118 25.4280	X	X		X	
4327	MBC	ABC-C	34 16.1292	120 18.3912	X	X	X	X	
4328	MEC	MEC-C	33 09.7194	117 23.1570	X	X		X	
4329	OC	OC	33 33.3750	118 01.3524	X	X	X	X	
4330	LA	LA	33 36.9984	118 15.5850	X	X			
4331	ABC	ABC	34 15.2964	119 19.5024	X	X		X	
4332	SD	SD	32 46.4406	117 16.4388	X	X		X	
4333	NA	NA	33 57.2862	118 34.2480					
4335	NA	NA	34 20.9886	119 34.1556					
4336	SV	MEC-C	33 21.2670	117 35.9298	X	X		X	
4338	HY		33 45.7494	118 12.4656	X	X	X		
4339	CINMS	CINMS	33 57.1908	119 41.2110	X	X	X	X	
4340	SD	NA	32 40.7346	117 07.6602	X	X	X		
4341	ABC	NA	33 58.3518	118 26.9382	X	X	X		
4342	NA	NA	33 50.4042	118 31.3296					
4343	MBC	MBC	34 21.0150	119 51.7770	X	X		X	
4344	NA	NA	33 12.3090	117 27.2898					
4345	CINMS	NA	33 54.3534	118 49.0830		X			
4346	LA	LA	33 36.1296	118 07.0002	X	X			
4347	CINMS	CINMS	34 06.7800	120 01.5588	X	X	X	X	
4348	SD	NA	32 42.3882	117 10.7820	X	X	X		

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4349	ABC	ABC	34 06.3018	119 11.7306	X	X		X	
4350	SV	SV	33 25.6800	117 41.1600	X	X		X	
4351	CINMS	CINMS	34 04.2672	120 19.7376	X	X	X	X	
4352	CINMS	NA	33 12.6600	117 45.3354		X			
4354	HY		33 44.9196	118 11.9202	X	X	X		
4355	NA	NA	34 15.5190	119 36.7356					
4356	SD	MEC-C	32 44.4894	117 25.6170	X	X	X	X	
4357	NA	NA	34 00.5448	118 38.4504					
4358	HY	VRG-C	33 52.8972	118 32.0922	X	X		X	
4361	CINMS	NA	33 15.2502	117 47.5836		X			
4362	LA	LA	33 38.2302	118 14.8848	X	X			
4363	CINMS	CINMS	33 58.6494	119 55.2918	X	X	X	X	
4364	SD	NA	32 40.7574	117 09.9036	X	X	X		
4365	HY	HY	33 57.6240	118 31.7622	X	X		X	
4366	OC	OC	33 30.4356	117 45.6078	X	X		X	
4367	ABC	ABC	34 27.7200	120 17.4672	X	X		X	
4368	CINMS	NA	33 07.6758	117 32.6058		X			
4369	OC	OC	33 34.5060	117 59.0934	X	X		X	
4370	HY		33 43.9008	118 12.2490	X	X	X		
4371	CINMS	CINMS	34 03.2058	119 31.7556	X	X	X	X	
4372	SD	NA	32 36.5022	117 07.5036	X	X	X		
4373	ABC	NA	33 59.0562	118 25.2030	X	X	X		
4374	OC	OC	33 40.9704	118 03.7536	X	X		X	
4375	ABC	ABC	34 23.4618	119 40.6248	X	X		X	
4376	SD	SD	32 40.8030	117 19.4358	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4377	CINMS	NA	33 57.3942	119 15.4590		X			
4378	LA	LA	33 32.7876	118 13.6296	X	X	X	X	
4379	MBC	MBC	34 24.3648	120 06.3600	X	X		X	
4380	CINMS	NA	33 36.8550	118 35.4696		X			
4381	ABC	ABC	34 07.7946	119 11.2530	X	X		X	
4382	LA	LA	33 31.8024	118 13.7076	X	X	X	X	
4383	CINMS	CINMS	34 09.6918	120 35.6454	X	X	X	X	
4384	MEC	MEC-C	32 59.9334	117 18.0696	X	X		X	
4385	OC	NA	33 36.6588	117 54.8958	X	X	X		
4386	MEC-C	VRG-C	33 45.3240	118 06.7974	X	X	X		
4387	ABC	NA	34 10.4424	119 13.4910	X	X	X		
4388	SD	SD	32 35.5572	117 23.4540	X	X		X	
4389	HY	HY	33 59.4360	119 01.6266	X	X		X	
4400	HY	VRG-C	33 43.3320	118 12.7014	X	X	X	X	
4401	CINMS	CINMS	34 01.3290	119 30.3228	X	X	X	X	
4404	OC	OC	33 43.3116	118 03.9216	X	X	X	X	
4408	HY	VRG-C	33 45.3042	118 09.8316	X	X	X	X	
4417	CINMS	CINMS	33 53.3760	120 04.9242	X	X	X	X	
4418	SD	SD	32 40.7988	117 10.3956	X	X	X	X	
4419	MBC	MBC	34 07.3686	119 19.8774	X	X		X	
4421	CINMS	CINMS	33 59.2782	120 22.8048	X	X	X	X	
4423	OC	OC	33 36.5088	117 53.7624	X	X	X	X	
4424	MEC-C	VRG-C	33 45.0696	118 06.7242	X	X	X	X	
4425	MBC	MBC	34 13.2750	119 38.5170	X	X		X	
4426	SD	SD	32 49.5264	117 21.9594	X	X		X	

STATION ID	GRAB AGENCY	TRAWL AGENCY	LATITUDE (dec. minutes)	LONGITUDE (dec. minutes)	BENTHIC INFAUNA	SEDIMENT CHEMISTRY	SEDIMENT TOXICITY	TRAWL	BIOACCUM
4442	SD	SD	32 38.0352	117 08.1858	X	X	X	X	
4446	CINMS	CINMS	33 27.0348	119 04.1562	X	X	X	X	
4453	CINMS	CINMS	33 56.9862	120 14.2284	X	X	X	X	
4458	SD	SD	32 35.8620	117 21.0750	X	X		X	
4481	CINMS	CINMS	34 05.7858	120 07.4310	X	X	X	X	

APPENDIX 3

Bight'03 Sample Processing

Analytical Laboratories

LEGEND TO BIGHT '03 ANALYTICAL LABORATORIES

ABC = Aquatic Bioassay & Consulting Laboratories

CRG = CRG Marine Laboratories

HY = City of Los Angeles Bureau of Sanitation (Hyperion Treatment Plant)

LA = Los Angeles County Sanitation District

MEC = MEC Analytical Systems, Inc.

OC = Orange County Sanitation District

SC = Southern California Coastal Water Research Project

SD = City of San Diego, Metropolitan Wastewater Department

USGS = United States Geologic Service

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4000	SD	SD	SD	SD	SD	SD	MEC-C
4001	CINMS	NA	SD	SD	SD	SD	NA
4002	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4003	ABC	ABC	HY	CRG	CRG	SC	NA
4004	SD	SD	SD	SD	SD	SD	MEC-C
4005	CINMS	NA	SD	SD	SD	SD	NA
4006	HY	HY	HY	HY	HY	SC	MEC-C
4007	MBC	SD	SD	SD	CRG	SD	ABC
4008	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4009	CINMS	NA	SD	SD	SD	SD	NA
4010	HY	HY	HY	HY	HY	SC	MEC-C
4011	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4012	SD	SD	SD	SD	SD	SD	NA
4013	ABC	ABC	HY	CRG	CRG	SC	ABC
4014	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4015	ABC	ABC	HY	CRG	CRG	SC	ABC
4016	MEC-C	MEC-C	SD	CRG	CRG	SC	MEC
4017	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4018	MEC-C	MEC-C	SD	CRG	CRG	SC	MEC
4019	ABC	ABC	HY	CRG	CRG	SC	ABC
4020	SD	SD	SD	SD	SD	SD	MEC-C
4021	HY	HY	HY	HY	HY	SC	MEC-C
4022	HY	HY	HY	HY	HY	SC	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4023	MBC	HY	SD	SD	CRG	SD	ABC
4024	MEC	MEC	SD	MEC	MEC	SC	NA
4025	CINMS	NA	SD	SD	SD	SD	NA
4026	LA	LA	HY	LA	LA	SC	ABC
4027	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4028	SD	SD	SD	SD	SD	SD	MEC-C
4029	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4030	OC	OC	SD	OC	OC	SC	NA
4031	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4032	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4033	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4034	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4035	ABC	ABC	HY	CRG	CRG	SC	ABC
4036	SD	SD	SD	SD	SD	SD	MEC-C
4037	HY	HY	HY	HY	HY	SC	MEC-C
4038	LA	LA	HY	LA	LA	SC	NA
4039	MBC	MEC-C	SD	SD	CRG	SD	ABC
4040	MEC	MEC	SD	MEC	MEC	SC	NA
4041	OC	OC	SD	OC	OC	SC	NA
4042	LA	LA	HY	LA	LA	SC	NA
4043	ABC	ABC	HY	CRG	CRG	SC	ABC
4044	SD	SD	SD	SD	SD	SD	MEC-C
4045	HY	HY	HY	HY	HY	SC	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4046	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4047	ABC	ABC	HY	CRG	CRG	SC	NA
4048	MEC	MEC	SD	MEC	MEC	SC	MEC
4049	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4050	HY	HY	HY	HY	HY	SC	MEC-C
4051	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4052	SD	SD	SD	SD	SD	SD	MEC-C
4053	ABC	ABC	HY	CRG	CRG	SC	ABC
4054	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4055	ABC	ABC	HY	CRG	CRG	SC	NA
4056	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4057	HY	HY	HY	HY	HY	SC	MEC-C
4058	OC	OC	SD	OC	OC	SC	OC
4059	MBC	HY	SD	SD	CRG	SD	ABC
4060	CINMS	NA	SD	SD	SD	SD	NA
4061	ABC	ABC	HY	CRG	CRG	SC	ABC
4062	SV	OC	SD	OC	OC	SC	NA
4063	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4064	MEC	MEC	SD	MEC	MEC	SC	NA
4065	OC	OC	SD	OC	OC	SC	OC
4066	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4067	MBC	HY	SD	SD	CRG	SD	ABC
4068	SD	SD	SD	SD	SD	SD	MEC-C

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4069	HY	HY	HY	HY	HY	SC	MEC-C
4070	LA	LA	HY	LA	LA	SC	NA
4071	MBC	MEC-C	SD	SD	CRG	SD	ABC
4072	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4073	OC	OC	SD	OC	OC	SC	NA
4074	CINMS	NA	SD	SD	SD	SD	NA
4075	MEC	ABC	HY	CRG	CRG	SC	ABC
4076	SD	SD	SD	SD	SD	SD	MEC-C
4077	HY	HY	HY	HY	HY	SC	NA
4078	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4079	ABC	ABC	HY	CRG	CRG	SC	ABC
4080	MEC	MEC	SD	MEC	MEC	SC	MEC
4081	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
4082	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4083	MBC	MEC-C	SD	SD	CRG	SD	ABC
4084	SD	SD	SD	SD	SD	SD	MEC-C
4085	ABC	ABC	HY	CRG	CRG	SC	ABC
4086	HY	HY	HY	HY	HY	SC	MEC-C
4087	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4088	MEC	MEC	SD	MEC	MEC	SC	MEC
4089	HY	HY	HY	HY	HY	SC	MEC-C
4090	LA	LA	HY	LA	LA	SC	ABC
4091	MBC	MEC-C	SD	SD	CRG	SD	ABC

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4092	SD	SD	SD	SD	SD	SD	MEC-C
4093	ABC	ABC	HY	CRG	CRG	SC	ABC
4094	SV	OC	SD	OC	OC	SC	NA
4095	CINMS	SD	SD	SD	SD	SD	MEC-C
4096	MEC	MEC	SD	MEC	MEC	SC	MEC
4097	OC	OC	SD	OC	OC	SC	OC
4098	HY	HY	HY	HY	HY	SC	MEC-C
4099	ABC	ABC	HY	CRG	CRG	SC	ABC
4100	CINMS	NA	SD	SD	SD	SD	NA
4101	HY	HY	HY	HY	HY	SC	MEC-C
4102	LA	LA	HY	LA	LA	SC	NA
4103	MBC	HY	SD	SD	CRG	SD	ABC
4104	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4105	CINMS	NA	SD	SD	SD	SD	NA
4106	CINMS	NA	SD	SD	SD	SD	NA
4107	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4108	SD	SD	SD	SD	SD	SD	MEC-C
4109	HY	HY	HY	HY	HY	SC	NA
4110	OC	OC	SD	OC	OC	SC	NA
4111	MBC	HY	SD	SD	CRG	SD	NA
4112	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4113	OC	OC	SD	OC	OC	SC	NA
4114	HY	HY	HY	HY	HY	SC	MEC-C

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4115	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4116	SD	SD	SD	SD	SD	SD	MEC-C
4117	ABC	ABC	HY	CRG	CRG	SC	ABC
4118	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4119	ABC	ABC	HY	CRG	CRG	SC	NA
4120	SD	SD	SD	SD	SD	SD	NA
4121	CINMS	NA	SD	SD	SD	SD	NA
4122	LA	LA	HY	LA	LA	SC	NA
4123	ABC	ABC	HY	CRG	CRG	SC	NA
4124	CINMS	NA	SD	SD	SD	SD	NA
4125	ABC-C	SD	SD	SD	CRG	SD	ABC
4126	SV	OC	SD	OC	OC	SC	NA
4127	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4128	SD	SD	SD	SD	SD	SD	NA
4129	OC	OC	SD	OC	OC	SC	OC
4130	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4131	ABC	ABC	HY	CRG	CRG	SC	ABC
4132	SD	SD	SD	SD	SD	SD	MEC-C
4133	ABC	ABC	HY	CRG	CRG	SC	NA
4134	LA	LA	HY	LA	LA	SC	NA
4135	MBC	SD	SD	SD	CRG	SD	ABC
4136	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
4137	OC	OC	SD	OC	OC	SC	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4138	HY	HY	HY	HY	HY	SC	MEC-C
4139	ABC	ABC	HY	CRG	CRG	SC	ABC
4140	SD	SD	SD	SD	SD	SD	MEC-C
4141	HY	HY	HY	HY	HY	SC	NA
4142	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4143	ABC	ABC	HY	CRG	CRG	SC	NA
4144	MEC	MEC	SD	MEC	MEC	SC	NA
4145	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4146	HY	HY	HY	HY	HY	SC	MEC-C
4147	ABC-C	HY	SD	SD	CRG	SD	NA
4148	SD	SD	SD	SD	SD	SD	MEC-C
4149	ABC	ABC	HY	CRG	CRG	SC	ABC
4150	HY	HY	HY	HY	HY	SC	NA
4151	ABC	ABC	HY	CRG	CRG	SC	NA
4152	MEC	MEC	SD	MEC	MEC	SC	NA
4153	CINMS	NA	SD	SD	SD	SD	NA
4154	OC	OC	SD	OC	OC	SC	NA
4155	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4156	SD	SD	SD	SD	SD	SD	MEC-C
4157	ABC	ABC	HY	CRG	CRG	SC	NA
4158	SV	OC	SD	OC	OC	SC	NA
4159	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4160	CINMS	NA	SD	SD	SD	SD	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4161	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4162	HY	HY	HY	HY	HY	SC	MEC-C
4163	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4164	SD	SD	SD	SD	SD	SD	NA
4165	HY	HY	HY	HY	HY	SC	NA
4166	LA	LA	HY	LA	LA	SC	NA
4167	MBC	MEC-C	SD	CRG	CRG	SD	NA
4168	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4169	OC	OC	SD	OC	OC	SC	OC
4170	LA	LA	HY	LA	LA	SC	NA
4171	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4172	SD	SD	SD	SD	SD	SD	NA
4173	HY	HY	HY	HY	HY	SC	NA
4174	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4175	ABC	ABC	HY	CRG	CRG	SC	NA
4176	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
4177	OC	OC	SD	OC	OC	SC	OC
4178	HY	HY	HY	HY	HY	SC	MEC-C
4179	MBC	SD	SD	SD	CRG	SD	ABC
4180	SD	SD	SD	SD	SD	SD	MEC-C
4181	HY	HY	HY	HY	HY	SC	NA
4182	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4183	ABC	ABC	HY	CRG	CRG	SC	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4184	SD	SD	SD	SD	SD	SD	NA
4185	HY	HY	HY	HY	HY	SC	NA
4186	LA	LA	HY	LA	LA	SC	NA
4187	MBC	HY	SD	SD	CRG	SD	NA
4188	CINMS	NA	SD	SD	SD	SD	NA
4189	ABC	ABC	HY	CRG	CRG	SC	NA
4190	NA	NA	NA	NA	SC	NA	NA
4191	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4192	MEC	MEC	SD	MEC	MEC	SC	NA
4193	OC	OC	SD	OC	OC	SC	OC
4194	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4195	MBC	HY	SD	SD	CRG	SD	NA
4196	CINMS	NA	SD	SD	SD	SD	NA
4197	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4198	LA	LA	HY	LA	LA	SC	NA
4199	MBC	SD	SD	SD	CRG	SD	ABC
4200	MEC	MEC	SD	MEC	MEC	SC	NA
4201	OC	OC	SD	OC	OC	SC	OC
4202	LA	LA	HY	LA	LA	SC	ABC
4203	ABC	ABC	HY	CRG	CRG	SC	NA
4204	SD	SD	SD	SD	SD	SD	MEC-C
4205	HY	HY	HY	HY	HY	SC	NA
4206	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4207	ABC	ABC	HY	CRG	CRG	SC	NA
4208	MEC	MEC	SD	MEC	MEC	SC	NA
4209	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4210	HY	HY	HY	HY	HY	SC	MEC-C
4211	MBC	LA	SD	SD	CRG	SD	ABC
4212	SD	SD	SD	SD	SD	SD	MEC-C
4213	ABC	ABC	HY	CRG	CRG	SC	ABC
4214	NA	NA	NA	NA	SC	NA	NA
4215	ABC	ABC	HY	CRG	CRG	SC	NA
4216	CINMS	NA	SD	SD	SD	SD	NA
4217	NA	NA	NA	NA	SC	NA	NA
4218	LA	LA	HY	LA	LA	SC	NA
4219	CINMS	NA	SD	SD	SD	SD	NA
4220	CINMS	NA	SD	SD	SD	SD	NA
4221	MEC	ABC	HY	CRG	CRG	SC	ABC
4222	SV	OC	SD	OC	OC	SC	NA
4223	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4224	CINMS	NA	SD	SD	SD	SD	NA
4225	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4226	HY	HY	HY	HY	HY	SC	MEC-C
4227	MBC	HY	SD	SD	CRG	SD	NA
4228	SD	SD	SD	SD	SD	SD	MEC-C
4229	NA	NA	NA	NA	SC	NA	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4230	HY	HY	HY	HY	HY	SC	NA
4231	NA	NA	NA	NA	SC	NA	NA
4232	MEC	MEC	SD	MEC	MEC	SC	NA
4233	CINMS	NA	SD	SD	SD	SD	NA
4234	LA	LA	HY	LA	LA	SC	NA
4235	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4236	SD	SD	SD	SD	SD	SD	MEC-C
4237	ABC-C	SD	SD	SD	CRG	SD	ABC
4238	OC	OC	SD	OC	OC	SC	NA
4239	MBC	SD	SD	SD	CRG	SD	ABC
4240	MEC	MEC	SD	MEC	MEC	SC	MEC
4241	OC	OC	SD	OC	OC	SC	NA
4242	HY	HY	HY	HY	HY	SC	MEC-C
4243	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4244	SD	SD	SD	SD	SD	SD	NA
4245	ABC	ABC	HY	CRG	CRG	SC	ABC
4246	MEC-C	MEC-C	SD	CRG	CRG	SC	MEC-C
4247	ABC	ABC	HY	CRG	CRG	SC	NA
4248	SD	SD	SD	SD	SD	SD	NA
4249	CINMS	NA	SD	SD	SD	SD	NA
4250	LA	LA	HY	LA	LA	SC	NA
4251	MBC	HY	SD	SD	CRG	SD	NA
4252	CINMS	NA	SD	SD	SD	SD	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4253	ABC	ABC	HY	CRG	CRG	SC	NA
4254	LA	LA	HY	LA	LA	SC	ABC
4255	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4256	SD	SD	SD	SD	SD	SD	NA
4257	OC	OC	SD	OC	OC	SC	OC
4258	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4259	ABC	ABC	HY	CRG	CRG	SC	NA
4260	SD	SD	SD	SD	SD	SD	NA
4261	HY	HY	HY	HY	HY	SC	MEC-C
4262	LA	LA	HY	LA	LA	SC	ABC
4263	MBC	SD	SD	SD	CRG	SD	ABC
4264	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4265	OC	OC	SD	OC	OC	SC	NA
4266	HY	HY	HY	HY	HY	SC	MEC-C
4267	ABC	ABC	HY	CRG	CRG	SC	NA
4268	SD	SD	SD	SD	SD	SD	MEC-C
4269	HY	HY	HY	HY	HY	SC	NA
4270	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4271	NA	NA	NA	NA	SC	NA	NA
4272	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4273	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4274	HY	HY	HY	HY	HY	SC	MEC-C
4275	NA	NA	NA	NA	SC	NA	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4276	SD	SD	SD	SD	SD	SD	MEC-C
4277	HY	HY	HY	HY	HY	SC	NA
4278	HY	HY	HY	HY	HY	SC	NA
4279	MBC	MEC-C	SD	CRG	CRG	SD	ABC
4280	MEC	MEC	SD	MEC	MEC	SC	NA
4281	NA	NA	NA	NA	SC	NA	NA
4282	LA	LA	HY	LA	LA	SC	NA
4283	CINMS	NA	SD	SD	SD	SD	NA
4284	SD	SD	SD	SD	SD	SD	MEC-C
4285	ABC-C	HY	SD	SD	CRG	SD	NA
4286	OC	OC	SD	OC	OC	SC	NA
4287	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4288	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4289	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
4290	LA	LA	HY	LA	LA	SC	NA
4291	ABC	ABC	HY	CRG	CRG	SC	NA
4292	SD	SD	SD	SD	SD	SD	NA
4293	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4294	LA	LA	HY	LA	LA	SC	NA
4295	MBC	LA	SD	SD	CRG	SD	ABC
4296	MEC	MEC	SD	MEC	MEC	SC	NA
4297	OC	OC	SD	OC	OC	SC	OC
4298	CINMS	NA	SD	SD	SD	SD	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4299	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4300	SD	SD	SD	SD	SD	SD	NA
4301	HY	HY	HY	HY	HY	SC	NA
4302	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4303	NA	NA	NA	NA	SC	NA	NA
4304	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4305	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4306	HY	HY	HY	HY	HY	SC	MEC-C
4307	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4308	SD	SD	SD	SD	SD	SD	MEC-C
4309	HY	HY	HY	HY	HY	SC	NA
4310	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4311	NA	NA	NA	NA	SC	NA	NA
4312	SD	SD	SD	SD	SD	SD	NA
4313	NA	NA	NA	NA	SC	NA	NA
4314	LA	LA	HY	LA	LA	SC	NA
4315	ABC	ABC	HY	CRG	CRG	SC	NA
4316	CINMS	NA	SD	SD	SD	SD	NA
4317	ABC	ABC	HY	CRG	CRG	SC	NA
4318	SV	OC	SD	OC	OC	SC	MEC-C
4319	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4320	MEC	MEC	SD	MEC	MEC	SC	NA
4321	OC	OC	SD	OC	OC	SC	OC

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4322	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4323	MBC	HY	SD	SD	CRG	SD	NA
4324	NA	NA	NA	NA	SC	NA	NA
4325	NA	NA	NA	NA	SC	NA	NA
4326	LA	LA	HY	LA	LA	SC	NA
4327	MBC	MEC-C	SD	SD	CRG	SD	ABC
4328	MEC	MEC	SD	MEC	MEC	SC	NA
4329	OC	OC	SD	OC	OC	SC	OC
4330	LA	LA	HY	LA	LA	SC	NA
4331	ABC	ABC	HY	CRG	CRG	SC	NA
4332	SD	SD	SD	SD	SD	SD	NA
4333	NA	NA	NA	NA	SC	NA	NA
4334	MBC	MEC-C	SD	CRG	CRG	SC	MEC-C
4335	NA	NA	NA	NA	SC	NA	NA
4336	SV	OC	SD	OC	OC	SC	NA
4337	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4338	HY	HY	HY	HY	HY	SC	MEC-C
4339	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4340	SD	SD	SD	SD	SD	SD	MEC-C
4341	ABC	ABC	HY	CRG	CRG	SC	ABC
4342	NA	NA	NA	NA	SC	NA	NA
4343	MBC	HY	SD	SD	CRG	SD	NA
4344	NA	NA	NA	NA	SC	NA	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4345	CINMS	NA	SD	SD	SD	SD	NA
4346	LA	LA	HY	LA	LA	SC	NA
4347	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4348	SD	SD	SD	SD	SD	SD	MEC-C
4349	ABC	ABC	HY	CRG	CRG	SC	NA
4350	SV	OC	SD	OC	OC	SC	NA
4351	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4352	CINMS	NA	SD	SD	SD	SD	NA
4353	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
4354	HY	HY	HY	HY	HY	SC	MEC-C
4355	NA	NA	NA	NA	SC	NA	NA
4356	SD	SD	SD	SD	SD	SD	MEC-C
4357	NA	NA	NA	NA	SC	NA	NA
4358	HY	HY	HY	HY	HY	SC	NA
4359	CINMS	NA	SD	SD	SD	SD	NA
4360	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4361	CINMS	NA	SD	SD	SD	SD	NA
4362	LA	LA	HY	LA	LA	SC	NA
4363	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4364	SD	SD	SD	SD	SD	SD	MEC-C
4365	HY	HY	HY	HY	HY	SC	NA
4366	OC	OC	SD	OC	OC	SC	NA
4367	ABC	ABC	HY	CRG	CRG	SC	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4368	CINMS	NA	SD	SD	SD	SD	NA
4369	OC	OC	SD	OC	OC	SC	NA
4370	HY	HY	HY	HY	HY	SC	MEC-C
4371	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4372	SD	SD	SD	SD	SD	SD	MEC-C
4373	ABC	ABC	HY	CRG	CRG	SC	ABC
4374	OC	OC	SD	OC	OC	SC	NA
4375	ABC	ABC	HY	CRG	CRG	SC	NA
4376	SD	SD	SD	SD	SD	SD	NA
4377	CINMS	NA	SD	SD	SD	SD	NA
4378	LA	LA	HY	LA	LA	SC	ABC
4379	MBC	HY	SD	SD	CRG	SD	NA
4380	CINMS	NA	SD	SD	SD	SD	NA
4381	ABC	ABC	HY	CRG	CRG	SC	NA
4382	LA	LA	HY	LA	LA	SC	ABC
4383	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4384	MEC	MEC	SD	MEC	MEC	SC	NA
4385	OC	OC	SD	OC	OC	SC	OC
4386	MEC-C	MEC-C	SD	CRG	CRG	SC	MEC
4387	ABC	ABC	HY	CRG	CRG	SC	ABC
4388	SD	SD	SD	SD	SD	SD	NA
4389	HY	HY	HY	HY	HY	SC	NA
4391	USGS	NA	TBD	TBD	TBD	TBD	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4400	HY	HY	HY	HY	HY	SC	MEC-C
4401	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4404	MEC-C	OC	SD	OC	OC	SC	OC
4408	HY	HY	HY	HY	HY	SC	MEC-C
4417	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4418	SD	SD	SD	SD	SD	SD	MEC-C
4419	ABC-C	MEC-C	SD	CRG	CRG	SD	NA
4421	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4422	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
4423	OC	OC	SD	OC	OC	SC	OC
4424	MEC-C	MEC-C	SD	CRG	CRG	SC	MEC
4425	MBC	HY	SD	SD	CRG	SD	NA
4426	SD	SD	SD	SD	SD	SD	NA
4442	SD	SD	SD	SD	SD	SD	MEC-C
4444	USGS	NA	TBD	TBD	TBD	TBD	NA
4446	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4453	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4458	SD	SD	SD	SD	SD	SD	NA
4460	USGS	NA	TBD	TBD	TBD	TBD	NA
4464	MLML	NA	NA	NA	NA	NA	NA
4472	MLML	NA	NA	NA	NA	NA	NA
4481	CINMS	MEC-C	SD	SD	SD	SD	MEC-C
4488	MLML	NA	NA	NA	NA	NA	NA

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
4494	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4495	USGS	NA	TBD	TBD	TBD	TBD	NA
4504	MLML	NA	NA	NA	NA	NA	NA
4511	USGS	NA	TBD	TBD	TBD	TBD	NA
4527	USGS	NA	TBD	TBD	TBD	TBD	NA
4568	MLML	NA	NA	NA	NA	NA	NA
4616	MLML	NA	NA	NA	NA	NA	NA
4632	MLML	NA	NA	NA	NA	NA	NA
4656	MLML	NA	NA	NA	NA	NA	NA
4695	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
4720	MLML	NA	NA	NA	NA	NA	NA
4744	MLML	NA	NA	NA	NA	NA	NA
4760	MLML	NA	NA	NA	NA	NA	NA
4784	MLML	NA	NA	NA	NA	NA	NA
4792	MLML	NA	NA	NA	NA	NA	NA
4999	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
5014	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
5301	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
5336	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-01	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-02	ABC	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-03	HY	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-04	HY	MEC-C	SD	CRG	CRG	SC	MEC-C

ANALYTICAL LABORATORIES

Station ID	Grab Agency	Infauna Analysis Lab	Grain Size Analysis Lab	Metals Analysis Lab	Organics Analysis Lab	TOC Analysis Lab	Toxicity Analysis Lab
BRI-05	HY	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-06	HY	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-07	OC	OC	SD	OC	OC	SC	OC
BRI-08	OC	OC	SD	OC	OC	SC	OC
BRI-09	OC	OC	SD	OC	OC	SC	OC
BRI-10	OC	OC	SD	OC	OC	SC	OC
BRI-11	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-12	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-13	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-14	MEC	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-15	SD	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-16	SD	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-17	SD	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-18	SD	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-19	SD	MEC-C	SD	CRG	CRG	SC	MEC-C
BRI-20	SD	MEC-C	SD	CRG	CRG	SC	MEC-C

APPENDIX 4

Bight'03 Field Sampling

Equipment and Supply List

BIGHT'03
EQUIPMENT AND SUPPLY LIST

GENERAL

Bight'03 Field Operation Manual
Bight'03 Workplan
Ship=s Log Data Sheets
Field Data Sheets
Clipboards
No. 2 Pencils
Waterproof Markers
Waterproof Paper Tags
First Aid Kits
Sunscreen
Protective Glasses
Gloves - Leather and Formalin
Hand Tools - Channel Locks or Pliers
Field Thermometers
Paper Towels and Cotton Towels
Kimwipes
Squirt Bottles
Floats/Anchors (to mark lost equipment)

TRAWL SURVEYS

7.6-M otter trawl net, doors, bridles (and extras)
Spare Chain, Shackles, and Rope
Sorting Buckets, Tubs and Tags
Field Guides and Keys
Ice Chest with Wet Ice
Ice Chest with Dry Ice
Dissecting Kits
Spring Scales, Tare Buckets, and Calibration Weights
Fish Measuring Boards
Jars
Ziplock
Plastic Bags and Whirlpack Bags
Buffered Formalin
Camera, Film, and Camera Board

BENTHIC SURVEYS

Modified Van Veen Grab Sampler
Plastic Centimeter Ruler
Timers
Screening Box with 1.0 mm Screen
Large Plastic Tubs
Relaxant in Seawater
Buffered Formalin
Sediment Scoops
Ice Chest with Wet Ice
Jars
- Sediment Chemistry
- Toxicity

Deionized Water
Brushes

APPENDIX 5

Bight'03 Sampling Vessel Specifications

Specifications of ocean sampling vessels participating in the Bight'03 survey, summer 2003.

SPECIFICATION	1	2	3	4
agency/owner	City of L.A.	City of L.A.	L.A.C.S.D.	L.A.C.S.D.
vessel name	La Mer	Marine Surveyor	Ocean Sentinel	Phaon
length (ft)	85	65	66	25
home port	Marina del Rey	San Pedro	Cabrillo	Cabrillo
call sign	WAM7628	WO5232	WAA9057	WTA5037
cellular phone	None	None	310/613-5434	310-415-4006
NAV EQUIPMENT				
radar	Yes	Yes	Yes	Yes
fathometer	Yes	Yes	Yes	Yes
GPS	Yes	Yes	Yes	Yes
DGPS	Yes	Yes	Yes	Yes
SAMPLING EQUIPMENT				
puller cat-head	Yes	Yes	Yes	Yes
wire dia/puller (in)	N/A	N/A	N/A	N/A
wire length/puller (ft)	N/A	N/A	N/A	N/A
winch/grab	Yes	Yes	Yes	No
wire dia/grab (in)	1/4	5/32	3/16	N/A
wire length/grab (ft)	2000	2000	3000	N/A
winch/trawl	Yes	Yes	Yes	No
wire dia/trawl (in)	3/8	5/16	3/8	N/A
wire length/trawl (ft)	3500	4000	4000	N/A
davit	Yes	Yes	Yes	Yes
A/H - frame	Yes	No	No	No
articulated crane	Yes	No	Yes	No
refrigerator	Yes	Yes	Yes	No
freezer	Yes	Yes	Yes	No

Specifications of ocean sampling vessels participating in the Bight'03 survey, summer 2003.

SPECIFICATION	5	6	7	8
agency/owner	City of S.D.	City of S.D.	NOAA/CINMS	ABC
vessel name	Monitor III	Metro	R/V SHEARWATER	Hey Jude
length (ft)	42	30	62	40
home port	Driscoll's Wharf	Driscoll's Wharf	Santa Barbara	Channel Islands Harbor
call sign	WUV9304	WUV9304	WDB2424	WYB3631
cellular phone	619/520-1926	619/247-1139	805/729-2727	805/340-0184
NAV EQUIPMENT				
radar	Yes	Yes	Yes	Yes
fathometer	Yes	Yes	Yes	Yes
GPS	Yes	Yes	Yes	Yes
DGPS	Yes	Yes	Yes	Yes
SAMPLING EQUIPMENT				
puller cat-head	No	No	No	N/A
wire dia/puller (in)	N/A	N/A	N/A	N/A
wire length/puller (ft)	N/A	N/A	N/A	Yes
winch/grab	Yes	Yes	Yes	9/16
wire dia/grab (in)	1/4	1/4	.322	4000
wire length/grab (ft)	750	750	6562	Yes
winch/trawl	Yes	No	Yes	9/16
wire dia/trawl (in)	1/4	N/A	.322	4000
wire length/trawl (ft)	2700	N/A	6562	Yes
davit	Yes	Yes	No	No
A/H - frame	Yes	No	Yes	No
articulated crane	No	No	Yes	Yes
refrigerator	Yes	No	Yes	No
freezer	No	No	Yes	

Specifications of ocean sampling vessels participating in the Bight'03 survey, summer 2003.

SPECIFICATION	9	10	11	12
agency/owner	MBC	MEC	SeaVentures	So. Cal. Mar. Inst.
vessel name	Westwind	Zephyr	Early Bird	Yellowfin
length (ft)	50	44	32	70
home port	Newport Beach	Ventura	Dana Point	Terminal Island
call sign	WYZ9810	WBZ3687	WAR 6030	WCW2778
cellular phone	714/321-8204	510/914-0157	949/637-2433	310/560-9917
NAV EQUIPMENT				
radar	Yes	Yes	Yes	Yes
fathometer	Yes	Yes	Yes	Yes
GPS	Yes	Yes	Yes	Yes
DGPS	Yes	Yes	Yes	Yes
SAMPLING EQUIPMENT				
puller cat-head	Yes	No	Yes	Yes
wire dia/puller (in)	N/A	N/A	N/A	N/A
wire length/puller (ft)	N/A	N/A	N/A	N/A
winch/grab	Yes	Yes	Yes	Yes
wire dia/grab (in)	1/4	1/4	1/4	7/16
wire length/grab ft)	5000	3000	2000	14000
winch/trawl	Yes	Yes	Yes	Yes
wire dia/trawl (in)	1/4	3/8	1/4	7/16
wire length/trawl (ft)	5000	14000	2000	14000
davit	No	Yes	No	No
A/H - frame	Yes	Yes	Yes	Yes
articulated crane	No	No	No	Yes
refrigerator	Yes	Yes	Yes	Yes
freezer	Yes	Yes	Yes	Yes

Specifications of ocean sampling vessels participating in the Bight'03 survey, summer 2003.

SPECIFICATION	13			
agency/owner	VRG-Occidental College			
vessel name	R/V Vantuna			
length (ft)	85			
home port	Terminal Island, San Pedro			
call sign	WS6107			
cellular phone	310/4154746			
NAV EQUIPMENT				
radar	Yes			
fathometer	Yes			
GPS	Yes			
DGPS	Yes			
SAMPLING EQUIPMENT				
puller cat-head	No			
wire dia/puller (in)	N/A			
wire length/puller (ft)	N/A			
winch/grab	Yes			
wire dia/grab (in)	5/32			
wire length/grab ft)	5000			
winch/trawl	Yes			
wire dia/trawl (in)	1/2			
wire length/trawl (ft)	7000			
davit	No			
A/H - frame	Yes			
articulated crane	No			
refrigerator	Yes			
freezer	Yes			

APPENDIX 6

Bight'03 Field Sampling

Data Sheets

Appendix 6 contains forms that will be used by field sampling teams. The following nine forms are provided:

Station Occupation & Grab Event

Station Occupation & Trawl Event

Bioaccumulation Fish Tracking Sheet

Demersal Fish Form (use as a double-sided form)

Demersal Fish, Size Class Form

Epibenthic Invertebrate Form (use as a double-sided form)

Demersal Fish, Quality Control Form

Trawl Debris Form

Chain of Custody Form

Sample Tracking FAX Transmittal form

NOTE: Most forms are single-sided. Two forms; DEMERSAL FISH FORM and EPIBENTHIC INVERTEBRATE FORM are intended to be used **double-sided**. They are provided as two page forms in this appendix. They should be printed out as masters and copied as double-sided forms for use in the field.

STATION OCCUPATION

AGENCY CODE

VESSEL

ARRIVAL TIME (hh:mm)

WEATHER (CHK ONE)

- ☐ Clear
- ☐ Rain
- ☐ Overcast
- ☐ Thunderstorm
- ☐ Partly Cloudy
- ☐ Fog
- ☐ Drizzle

SEA STATE (CHK ONE)

- ☐ Calm
- ☐ Choppy
- ☐ Rough

SALINITY: (PPT)

(At Estuary Sites only)

STATION ID

DATE day / month / year

☐ ABANDONED SITE? Y or N (if Y explain in comments)

STATION FAIL CODE (5)

WIND

Speed (kts) ____________

Direction (4) ____________

SWELL

Period (s) ____________

Height (ft) ____________

Direction (4) ____________

NAV TYPE: (CHK ONE)

☐ DGPS ☐ GPS

EQUIPMENT TYPE: (7)

STATION COMMENTS:

GRAB EVENTS

Sample Types (Chk all that apply)

#	TIME (hh:mm)	Latitude DD° MM.mmmm	Longitude DD° MM.mmmm	Depth (m)	Dist to Target (m)	Grab Fail Code (6)	Penetration (cm)	Composition (1)	Odor (2)	Color (3)	Shell Hash? (Y/N)	Infauna	Sed Chem	GrainSize	Sed Tox
												☐	☐	☐	☐
	Grab Event Comments:														
												☐	☐	☐	☐
	Grab Event Comments:														
												☐	☐	☐	☐
	Grab Event Comments:														
												☐	☐	☐	☐
	Grab Event Comments:														
												☐	☐	☐	☐
	Grab Event Comments:														
												☐	☐	☐	☐
	Grab Event Comments:														

1 Sediment Composition: Coarse sand, Fine sand, Silt/clay, Gravel, Cobble, Mixed
2 Sediment Odor: None (N), Petroleum(P), Hydrogen sulfide (HS), Humic (HU), Other (O, *describe in Comments*)
3 Sediment Color: Brown, Gray, Black, Olive green, Red
4 Directions: N, NE, E, SE, SW, W, NW, or XX for calm
5 Station Fail Codes: Rocky bottom, Kelp bed, Obstructions, Other (*Comment required*)
6 Grab Fail Codes: Canted, Washed, Poor Closure, Disturbed surface, <5cm penetration, Outside radius limit, Not within 10% of Target-site depth, Other (*Comment required*)
7 Equipment Types: Single Van Veen, Tandem Van Veen

NOTE: Grab Event information (i.e., Time, Lat & Long, Depth, Dist. to Target) applies to both grabs of a Tandem Van Veen. If using a Tandem van Veen, penetration and sediment description should come from the infaunal sample or, if neither grab is for infauna, from one of the paired grabs. If companion grab differs, record info for that grab in Grab Event Comments. Sampling protocol requires that all samples at a site be of similar sediment type.

STATION OCCUPATION

PAGE ___ of ___

AGENCY CODE

VESSEL NAME

TIME (hh:mm)

NAV TYPE (check one)

DGPS

GPS

STATION ID

DATE

day / month / year

STATION FAIL CODE (2)

WEATHER (Circle one)

Clear
Overcast
Partly Cloudy
Thunderstorm
Rain
Drizzle
Fog
Continuous layers of clouds

WIND

Speed (kts) ________

Direction (1) ________

SWELL

Period (s) ________

Height (ft) ________

Direction (1) ________

SEA STATE (Circle one)

Calm

Rough

Choppy

Abandoned Site ?

Y or N (if Y explain in comments)

COMMENTS:

TRAWL EVENT

TRAWL NUMBER

TRAWL FAILURE (3)

	TIME hh:mm:ss	LATITUDE Degrees	LATITUDE minutes	LONGITUDE Degrees	LONGITUDE minutes	DEPTH meters
Net over						
Start Trawl						
End Trawl						
Net on deck						

WIRE OUT (m)

Distance to Target

Lotek Data? YES / NO

TRAWL USES (check all that apply)

Community Structure

Tissue Chemistry

1. Directions: N, NE, E, SE, S, SW, W, NW, or XX for calm
2. Station Failure codes: Rocky Bottom, Kelp bed, Obstructions, Failed trawls

3. Trawl Failure Reasons: Fouled Net, Torn Net, No Contact with Bottom, Improper Time/Distance, >10% Depth from Target, Ouside radius limit

BIGHT'03 BIOACCUMULATION FISH TRACKING SHEET

AGENCY:__________________________ **DATE:** ______________________________________

STATION:__________________________ **COMPLETED BY:** ________________________________

SANDDAB GUILD SPECIES		**Age Class 0**	**1**	**2**
speckled sanddab	**Size Class**	**5 - 7**	**8 - 10**	**11 - 16**
	Number			
longfin sanddab	**Size Class**	**5 - 8**	**9 - 13**	**14 - 16**
	Number			
Pacific Sanddab	**Size Class**	**5 - 8**	**9 - 13**	**14 - 16**
	Number			
gulf sanddab	**Size Class**	**5 - 7**	**8 - 9**	**10 -14**
	Number			
slender sole	**Size Class**	**5 - 8**	**9 - 10**	**11 - 12**
	Number			
California halibut (juv)	**Size Class**	**5 - 9**	**10 - 20**	
	Number			
petrale sole	**Size Class**	**5 - 7**	**8 - 14**	**15 - 20**
	Number			

Target 6 individuals per age class for each species. If 6 individuals are collected in 1 age class of 1 species, then no additional trawls are required.
For all species, save all age classes with 6 individuals.

COMMENTS: ____

BIGHT'03 DEMERSAL FISH FORM

Page ____ of _____

Station: __________ Date: ____________ Completed by:________________

Species	N	Std Length Size Class (cm) *Up to 10 indivs. Use Size Class sheet for more abundant spp*	FID *or* #V	Weight (Kg) Gross	Tare	Net
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

Anomaly Codes (*record as superscript to length measurement*): A = ambicoloration B = albinism D = skeletal deformity
E = copepod eye-parasite (i.e., *Phrixocephalus*) F = fin erosion L = lesion (*describe in* Comments)
O = other anomaly (*describe in* Comments) P = other external parasite (*describe in* Comments) T = tumor
FID = *specimen(s) collected for further identification* #V = *Number of specimens collected as species vouchers* *(circle one)*

Data from Short/Long Trawl @ >300 M Depth?: YES NO

Comments: ____

____

ALIQUOT RECORDING & CALCULATIONS (ALL WEIGHTS IN KG)

	ALIQUOT DATA			
	N	**Gross (Kg)**	**Tare (Kg)**	**Net (Kg)**
Species:				

Record Catch Gross wts here:	*Show Calcs here:*
	Catch Gross wt: - Catch Tare wt = Catch Net Wt
	__________ - __________ = __________
	(Catch Net wt ÷ Aliquot Net wt) x # in Aliquot = Abundance
	________________ *x* ________ = ________

BIGHT'03 DEMERSAL FISH SIZE CLASS FORM

Station: __________ **Date:** ____________________ **Completed by:** ________________

Gross (kg): ___________ **Tare (kg):** ___________ **Net (kg):** ___________

Size Class	N	SPECIES:
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

Total:______ **Comments:** ____

____

Anomaly Codes (*record as superscript to tally mark*): A = ambicoloration B = albinism D = skeletal deformity E = copepod eye-parasite (i.e., *Phrixocephalus*) F = fin erosion L = lesion (*describe in* Comments) O = other anomaly (*describe in* Comments) P = other external parasite (*describe in* Comments) T = tumor

BIGHT'03 EPIBENTHIC INVERTEBRATE FORM

Page ____ of _____

Station: __________ **Date:** ____________ **Completed by:**________________

Species	**N**	**Comments** (*or Anomalies*)	**FID** *or* **#V**	**Weight (Kg)** Gross	Tare	Net
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						

Anomaly Codes: **B** = burnspot **P** = external Parasite **O** = other anomaly (*describe in* Comments*)*

FID = *specimen(s) collected for further identification* #V = *Number of specimens collected as species vouchers*

(circle one)

Data from Short/Long Trawl @ >300 M Depth?: YES NO

Comments: ____

____

ALIQUOT RECORDING & CALCULATIONS (ALL WEIGHTS IN KG)

ALIQUOT DATA

N	Gross (Kg)	Tare (Kg)	Net (Kg)

Recore Catch Gross wts here:

Show Calcs here:

Catch Gross wt: - Catch Tare wt = Catch Net Wt

__________ - __________ = __________

(Catch Net wt ÷ Aliquot Net wt) x # in Aliquot = Abundance

__________ *x* __________ = __________

Species:

ALIQUOT DATA

N	Gross (Kg)	Tare (Kg)	Net (Kg)

Record Catch Gross wts here:

Show Calcs here:

Catch Gross wt: - Catch Tare wt = Catch Net Wt

__________ - __________ = __________

(Catch Net wt ÷ Aliquot Net wt) x # in Aliquot = Abundance

__________ *x* __________ = __________

Species:

ALIQUOT DATA

N	Gross (Kg)	Tare (Kg)	Net (Kg)

Record Catch Gross wts here:

Show Calcs here:

Catch Gross wt: - Catch Tare wt = Catch Net Wt

__________ - __________ = __________

(Catch Net wt ÷ Aliquot Net wt) x # in Aliquot = Abundance

__________ *x* __________ = __________

BIGHT'03 DEMERSAL FISH, QUALITY CONTROL FORM

Station: _________ **Date:** _____________ **Completed by:** ______________________

Original ID: _________________________________

	Gross	Tare	Net
Orig. Weight:			Kg
QC Re-Weigh:			Kg

Size Class	N	QC Re-ID: (*if different from Original ID*)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
		Other Species found in lot:
		Other Species Weight Gross (kg): Tare (kg): Net (kg):

Total:_______ **Comments:** ____

____

____

Anomaly Codes (*record as superscript to tally mark*): A = ambicoloration B = albinism D = skeletal deformity E = copepod eye-parasite (i.e., *Phrixocephalus*) F = fin erosion L = lesion (*describe in* Comments) O = other anomaly (*describe in* Comments) P = other external parasite (*describe in* Comments) T = tumor

BIGHT'03 TRAWL DEBRIS FORM

Page ____ of _____

Station: __________ **Date:** ____________ **Completed by:**_______________

Debris Type	Estimated Number	Estimated Weight
Rocks		
Terrestrial Vegetation		
Marine Vegetation		
Lumber		
Plastic		
Metal Debris		
Cans		
Glass Bottles		
Fishing Gear		
Tires		
Other (*describe in* Comments)		

Number Codes:		Weight Codes:	
Present,	**P** = 1	Trace,	**T** = 0.0-0.1 kg
Low,	**L** = 2-10	Low,	**L** = 0.2-1.0 kg
Moderate,	**M** = 11-100	Moderate,	**M** = 1.1-10 kg
High,	**H** =/> 100	High,	**H** =/> 10 kg

(circle one)

Data from Short/Long Trawl @ >300 M Depth?: YES NO

Comments: ____

____

____

____

BIGHT'03 CHAIN OF CUSTODY FORM

AGENCY: _____________________ **CONTACT NAME/NUMBER:** ________________________

SAMPLED BY: ______________________________________ **DATE:** _____________________

STATION	SAMPLE TYPE	CONTAINER TYPE	# CONTAINERS

Relinquished by: __________________________ **Accepted By:** __________________________

Agency: _________________________________ **Agency:** ______________________________

Signature: ___________________________ **Signature:**_____________________________

Date: _________________________ **Time:** ________________________

Relinquished by: __________________________ **Accepted By:** __________________________

Agency: _________________________________ **Agency:** ______________________________

Signature: ___________________________ **Signature:**_____________________________

Date: _________________________ **Time:** ________________________

Comments: ____

BIGHT'03 SAMPLE TRACKING FAX TRANSMITTAL FORM

AGENCY: ____________________________ **DATE:** _________________________________

NAME/NUMBER: ____________________________________ **PAGE:** __________ **OF** ___________

Station[1]	Sample Description	Sample Disposition

1- Include all stations that have been abandoned during the sampling day(s) and describe the reason for each instance of abandonment.

APPENDIX 7

Bight'03 Field Sampling QA/QC Sheets

Otter Trawl Checklist

Agency: ______ **Vessel:** ______________ **Date:** ______________________

EQUIPMENT AND PROCEDURES	Yes	No	N/A	Comments
Equipment Specifications				
Net Headrope (7.6 m)				
Body Mesh Size (4.1 cm)				
Cod-end Liner Mesh Size (1.3 cm)				
Noncrushable Floats				
Footrope Chain				
Otter Boards (51 x 76 cm or 20 x 30 in.)				
Bridle Length (22.9 m)				
Lotek Archival Tag mounted on Door				
Lotek Archival Tag Reader				
Other				
Trawling Procedures				
Properly Deployed				
Proper Wire Scope				
Bottom Time (10 min coast, 5 min bays)				
Successful Trawl				
Qualified Crew				
Other				

Notes:

BIGHT'03 FIELD QA/QC

Trawl Processing Equipment Checklist

Agency: ______________________ **Vessel:** __________ **Date:** _______________

EQUIPMENT	Yes	No	N/A	Comments
Sorting Buckets/Trays				
Live Holding Tanks (optional)				
Measuring Boards				
Data Sheets				
Trawl Cover Sheets				
Trawl Fish Species Sheets				
Trawl Fish Size Class Sheets				
Trawl Invertebrate Species Sheets				
Trawl Debris Sheets				
Tare Container				
Spring Scales				
3 kg				
15 kg				
Other				
Other				
Field Guides and Aids				
Miller and Lea (1972)				
Eschmeyer et al. (1983)				
Kramer et al. (1995) (flatfishes)				
Allen (1977) (juvenile rockfishes)				
Orr et al. (2000) rockfishes				
Other				
Field ID Tool Kit				
Wide-mouth Jars (Plastic)				
Plastic Bags				
10% Buffered Formalin				
Freezer or Ice Chest				
Other				

SPRING SCALE CALIBRATION CHECK

	Weight (kg)				
Test Weight	Scale A	Scale B	Scale C	Scale D	Scale E
0.15 kg					
0.30 kg					
0.45 kg					

BIGHT'03 FIELD QA/QC

Trawl Processing Procedures Checklist

Agency: ______ **Vessel:** ______________ **Date:** ______________________

EQUIPMENT	Yes	No	N/A	Comments
Proper Trawl Acceptance				
Removal of All Organisms from Net				
Species Identifications:				
Qualified Staff				
Accurate ID of Common Species				
Return of Difficult Species to Lab				
Length Measurement:				
Proper Designation of Size Class				
Proper Data Sheet Recording for <10 Fish				
Proper Recording on Size Class Data Sheet				
Bony Fish (Standard Length)				
Sharks, Rays, Ratfish (Total Length)				
Stingrays (Wingspan)				
Weight Measurement:				
Scales Calibrated				
Tare Bucket Weight Checked				
Proper Weighing Procedures:				
Species Greater than 0.1 kg				
Species Less than 0.1 kg				
Invertebrate Counts Made				
Invertebrate Counts from Weights				
Anomaly Examination Conducted				
Proper Anomaly Identifications				
Proper Anomaly Notation on Data Sheets				
Debris Assessment Conducted				
FID/Voucher Preservation				
10% Buffered Formalin				
Slitting Body Cavity of Fish				
Proper Labeling				
Proper Photographic Techniques				
Photo Log				
Completion of Data Sheets				
Trawl Cover Sheets				
Trawl Fish Species Sheets				
Trawl Fish Size Class Sheets				
Trawl Invertebrate Species Sheets				
Trawl Debris Data Sheets				
Tissue Sampling:				
Proper Choice of Species				
Proper Labeling				
Proper Freezing Techniques				

BIGHT'03 FIELD QA/QC

Fish and Invertebrate Identification and Processing Audit

Agency: ____________ **Vessel:** ____________ **Date:** ___

Trawls

Attempted ______
Successful ______
Percent ______

Species Identification

Number Species Examined ______
Number Species Correct ______
Percent Species Correct

Incorrect ID	Correct ID

Anomaly Identification

No. Anomalies Examined ______
No. Anomalies Correct ______
% Anomalies Correct ______
Problem Anomalies:

Incorrect ID	Correct ID

	Count			Size			Weight(kg)		
Species	Listed	Audited	% Diff.	Listed	Audited	%Diff.	Listed	Audited	%Diff.
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Comments ______

Completed by ______

BIGHT'03
FIELD QA/QC BENTHIC SAMPLING CHECKLIST

Agency: ________________ Vessel: __________________ Date: ____________________

PART 1 BENTHIC SAMPLE PROCESSING EQUIPMENT

Van Veen Grab	YES	NO	COMMENTS
Grab in good condition?			
Tight closures, no gaps, clean & free of rust	______	______	______

Benthic Infaunal Samples	YES	NO	COMMENTS
Catchment for grab overlying and wash waters	______	______	______
Plastic ruler (mm)	______	______	______
Wash table (recommended)	______	______	______
Screen box with 1.0mm mesh screen	______	______	______
Borate buffered Formalin (50 g/L undiluted formalin)	______	______	______
Relaxant Solution (check one)	____MgSO4 (1.5 kg/20 L fresh water)		______
	____Propylene phenoxytol (30 ml/20 L seawater)		______
Data sheets/field computer	______	______	______
BIGHT'03 format sample labels (external & internal)	______	______	______
Forceps for picking screen	______	______	______
Scrub brush for cleaning screen	______	______	______
Sample containers (none <16 oz capacity)	______	______	______
Adequate size range of sample containers	______	______	______

Sediment Chemistry & Toxicity Samples	YES	NO	COMMENTS
Correct scoop material for sub-sampling	______	______	______
Soap & water wash for scoop	______	______	______
scoop rinse (circle one or more)	DI water	methanol	acetone hexane methylene chloride
BIGHT'03 format sample labels (external)	______	______	______
4 oz plastic or glass containers or whirlpak for Grain Size	______	______	______
8 oz pre-cleaned glass containers with TFE lined lids for TOC	______	______	______
8 oz pre-cleaned plastic containers with TFE lined lids for Trace Metals	______	______	______
8 oz pre-cleaned glass containers with TFE lined lids for Trace Organics	______	______	______
1 liter pre-cleaned HDPE containers (supplied by SCCWRP) for Sed Tox	______	______	______
Refrigerator or wet ice for cooling	______	______	______
Freezer or dry ice for freezing	______	______	______

Comments: ____

BIGHT'03
FIELD QA/QC BENTHIC SAMPLING CHECKLIST

PART 2 BENTHIC SAMPLE PROCESSING PROCEDURES

Infaunal Sample Acceptance and Screening	YES	NO	
Properly applies sample acceptance criteria	______	______	______
Means of collecting wash water/sample	______	______	______
Penetration depth properly measured (plastic ruler)	______	______	______
Filters wash water	______	______	______
Uses wash table (recommended)	______	______	______
Screen mesh size = 1.0 mm	______	______	______
Screen surface area adequate for washing	______	______	______
Gentle treatment of sample during washing & screening	______	______	______
Thorough removal of sample from screen	______	______	______
Screen washed and scrubed between samples	______	______	______

Infaunal Sample Handling			
Labeling requirements met	______	______	______
Sample container <70% full of sample material	______	______	______
Adequate volume of relaxant used (85-90% jar volume)	______	______	______
Sample agitated to assure exposure to relaxant solution	______	______	______
Proper duration of exposure to relaxant (approx. 30 mins)	______	______	______
Measures to avoid environmental extremes during sample relaxation	______	______	______
Adequate fixative added to achieve approx. 10% Formalin	______	______	______
Sample agitated to assure exposure to fixative	______	______	______
Complete data entry	______	______	______

Sediment Chemistry & Toxicity Sample Handling			
Properly applies sample acceptance criteria (sample must be similar to infaunal sample)	______	______	______
Appropriate care draining overlying water from grab (use of siphon recommended)	______	______	______
Avoids potential sources of contamination (deck surface, winch wire, engine exhaust, cooling ice, etc)	______	______	______
Correct scoop used on Chemistry samples	______	______	______
TOC (SS), Metals (Plastic or SS), Organics (SS), Tox (plastic)			
Subsamples to specified depth (top 2 cm)	______	______	______
Avoids scoop contact with sides of grab	______	______	______
Labeling requirements met	______	______	______
Sample holding conditions met	______	______	______
Washes scoop between stations	______	______	______
Complete data entry	______	______	______

Comments: ____
____
____
____

BIGHT'03 Benthic QA Specialist: _________________ Agency Cruise Leader: ___________________

Send copies to: Agency Chief Scientist, BIGHT'03 Field Coordinator

APPENDIX 8

Bight'03 Sampling Organization and Analytical Laboratory Contacts

SAMPLING ORGANIZATION CONTACTS

Aquatic Bioassay and Consulting Laboratories
29 North Olive St., Ventura, CA 93001
Michael Machuzak (805) 643-5621
aquabio@pacbell.net

Channel Islands National Marine Sanctuary
113 Harbor Way
Santa Barbara, CA 93109
Sarah Fangman (805) 884-1473
sarah.fangman@noaa.gov

CRG Marine Laboratories
2020 Del Amo Blvd., Suite 200
Torrance, CA 90501
Richard Gossett (310) 533-5190

Los Angeles County Sanitation Districts
Ocean Monitoring & Research Group
1955 Workman Mill Road, Whittier, CA 90601
Dave Montagne (562) 699-7411 x 2805
dmontagne@lacsd.org

City of Los Angeles, Environmental Monitoring Division
12000 Vista del Mar, Playa del Rey, CA 90293
Ann Dalkey (310) 648-5544
cam@san.lacity.org

MEC Analytical Systems, Inc.
2433 Impala Drive
Carlsbad, CA 92008-7227
Douglas Diener (760) 931-8081
diener@mecanalytical.com

Orange County Sanitation District
10844 Ellis Ave., Fountain Valley, CA 92728-7018
George Robertson (714) 593-7468
grobertson@ocsd.com

City of San Diego
Metropolitan Wastewater Department,
Environmental Monitoring and Technical Services Division.
4918 North Harbor Drive, Suite 101
San Diego, CA 92106
Mike Kelly (619) 758-2342
mkelly@sandiego.gov

Southern California Coastal Water Research Project
7171 Fenwick Lane
Westminster, CA 92683
Ken Schiff (714) 372-9202
kens@sccwrp.org

SeaVentures
33207 Paseo Cerveza
San Juan Capistrano, CA 92675
Ken Nielsen (949) 637-2433
fishermansalley@cox.net

Vantuna Research Group
Moore Laboratory of Zoology
Occidental College
1600 Campus Rd.
Los Angeles, CA 90041
Dan Pondella (323) 259-2955
pondella@oxy.edu

APPENDIX 9

Bight'03 SCCWRP Sample Shipping Information

Bight'03 Sample Shipping Information

Contact: Darrin Greenstein
Phone: (714) 372-9224
FAX: (714) 894-9699

Shipping Address:

SCCWRP
7171 Fenwick Lane
Westminster, CA 92683
Attn: Darin Greenstein

In advance of any shipment of samples, please FAX Darrin a list of the samples he can expect to receive. A copy of the FAX transmittal sheet is in Appendix 6.

Please call ahead to make an appointment to deliver samples in person to SCCWRP and try to avoid late deliveries on Fridays. If Darrin is not available to receive the call, leave a message and he will automatically be paged. Those making deliveries with prearranged appointments will be processed before others without one. There will be someone at SCCWRP between 7:00 a.m. and 5:00 p.m. Monday through Friday. Arrangements can be made to receive samples outside of normal working hours, or on weekends if necessary.

If samples are shipped using a commercial carrier, such as Fed-Ex, please FAX Darrin a copy of the weigh bill. This proved useful in '98 to track/locate samples that that were misplaced.

Darrin will be the main contact for coordinating sample handling at SCCWRP. If Darrin is not available, please contact Shelly Moore (714) 372- 9207, or Brian Pauley (714) 894-2222.

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