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National Air and Radiation
Environmental Laboratory
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Radiological Survey of Naval Facilities on San Diego Bay

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Roger Goodman

November 1998

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EXECUTIVE SUMMARY

In 1996, the Naval Sea Systems Command (NAVSEA) and the U.S. Environmental Protection Agency's National Air and Radiation Environmental Laboratory (NAREL) signed an interagency agreement whereby NAREL would perform radiological surveys over the next five years at active naval facilities serving nuclear-powered warships. These surveys assess whether the construction, maintenance, operation, overhaul, or refueling of nuclear-powered warships have created elevated levels of radioactivity that could result in potential exposure to nearby populations or contamination of the environment.

This report covers the survey of the San Diego Harbor, conducted in March of 1997. During this survey 132 samples were collected including 21 background samples and 15 duplicate samples. Samples included drinking water, harbor water, sediment, sediment cores, and biota. All samples were analyzed for gross alpha and beta activities and gamma emitting radionuclides, and some samples were also analyzed for radium-226 and isotopes of uranium, plutonium, and thorium. In addition to sample collection and analysis, radiation surveys were performed using portable survey instruments to detect gamma radiation.

With the exception of one core sediment sample, all of the harbor sediment and core sediment samples, shoreline sediment samples, water samples, and biota samples from the San Diego Harbor contained no detectable levels of radioactivity other than those occurring naturally or attributable to fallout from atmospheric nuclear tests or the Chernobyl reactor accident in 1986. At the submarine base, a trace amount of cobalt-60 (0.022 ± 0.012 pCi/g-dry weight) was detected in one segment of one sediment core sample. External radiation measurements did not indicate any increased radiation exposure above natural background levels. Based on this radiological survey, practices regarding nuclear-powered warship operations at San Diego Harbor have resulted in no increases in radioactivity causing significant population exposure or contamination of the environment.

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1.0 INTRODUCTION

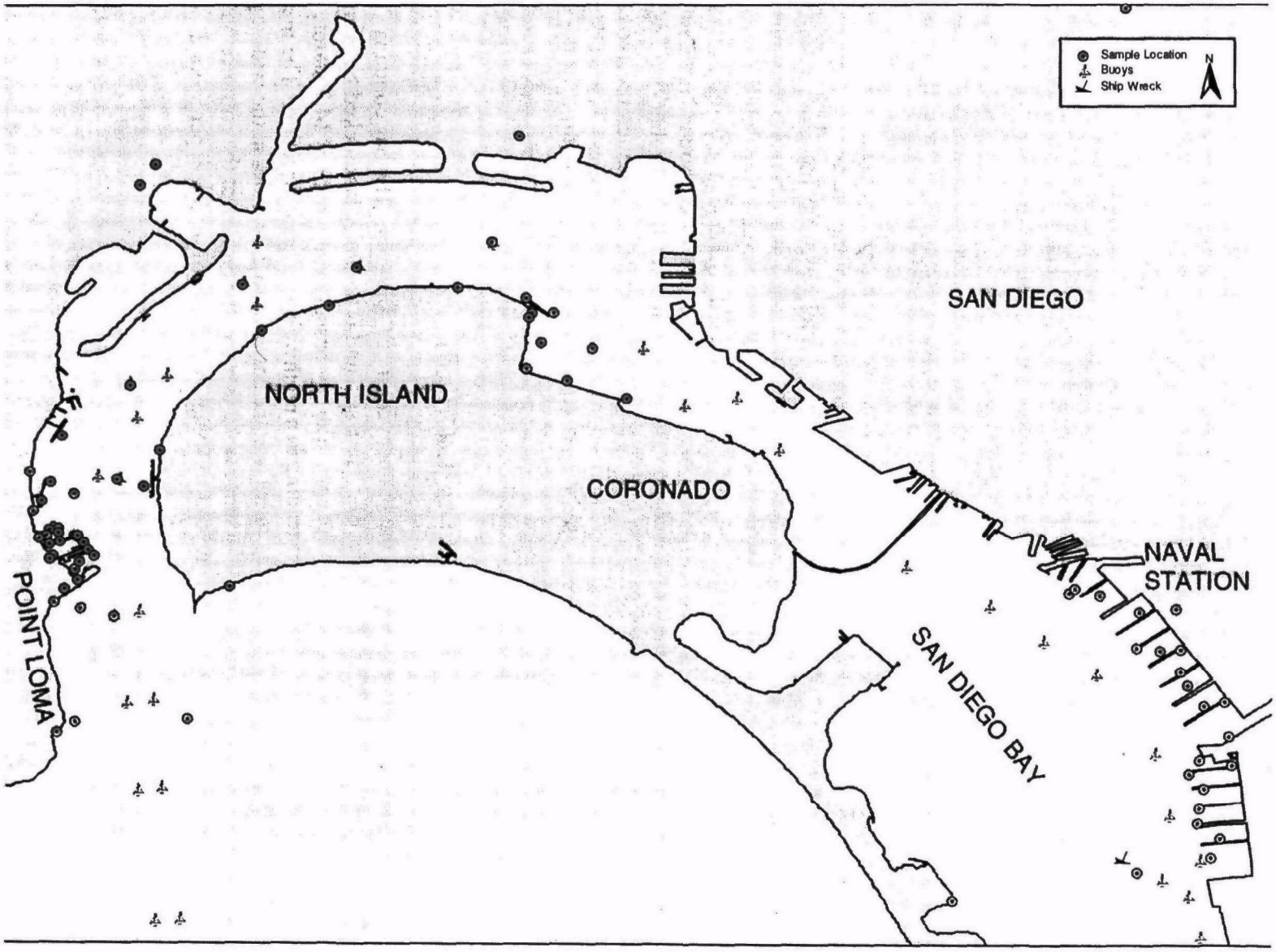
In 1996, the Naval Sea Systems Command (NAVSEA) and the U.S. Environmental Protection Agency's National Air and Radiation Environmental Laboratory (NAREL) signed an interagency agreement whereby NAREL would perform radiological surveys over the next five years at active facilities serving nuclear-powered warships. These surveys assess whether the construction, maintenance, operation, overhaul, or refueling of nuclear-powered warships have created elevated levels of radioactivity that could result in potential exposure to nearby populations or contamination of the environment. NAREL, in cooperation with NAVSEA, has previously surveyed facilities serving nuclear-powered warships. These surveys began in 1963 and have been conducted at Navy harbors and shipyards on the Atlantic, Pacific, and Gulf of Mexico coasts of the Continental United States and at Pearl Harbor, Hawaii.

The first environmental study under the IAG was performed September 9-20, 1996, at the Puget Sound Naval Shipyard (PSNS) at Bremerton, Washington, and the Naval Submarine Base (NSBB) near Bangor, Washington. The second environmental study under the IAG was performed March 17-27, 1997 at the Naval Station, San Diego; Naval Submarine Base, San Diego; and Naval Air Station/North Island, San Diego. A pre-survey trip was made January 7-8, 1997, to develop a sampling and survey work plan (EPA97a) with the assistance of knowledgeable site personnel. NAVSEA, San Diego, and Puget Sound Naval Shipyard staff provided information for NAREL on past and present San Diego Harbor radiological operations and procedures. The study design was based on information received for the present study and on information derived from previous EPA studies. The work plan for this study describes the approach used for assessing the radiological condition of the San Diego Bay aquatic environments.

1.1 Site Description and History (Ca67, Se89)

San Diego Bay is located on the southern coast of California. The bay contains approximately 22 square miles of surface area and is naturally landlocked by Point Loma on the west and North Island on the east. The bay has an axial length of 14.7 statute miles with the main portion of the bay extending in a northwest-southeast direction. The mean width is 1.26 miles, varying from 0.31 miles near the entrance to 2.24 miles at the widest point near the Otay river. The mean tidal range is 4.2 feet and the current at the entrance has an average velocity of 2.4 feet per second and a maximum velocity of 4.55 feet per second. A chart of the bay is shown in Fig. 1.0.

Fig. 1.0. ALL SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 2 THROUGH 7
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.



Freshwater inflow for the bay consists of storm runoff and four small rivers which are dry in the summer. This freshwater flow is so small that there are no stream gauge records showing actual volumes. The average annual rainfall, 10.6 inches, falls predominantly from October through May. Due to the absence of extensive silting from freshwater streams, a minimum of maintenance dredging is required in the bay. The bottom of the bay is characterized by shells and small gravel.

Commercial fishing is prohibited in the bay, but sport fishing is popular and is centered around the municipal fishing pier on Shelter Island. The bay is also a popular area for power boating and sailing. Agriculture is not present along the perimeter of the harbor.

The United States Census estimated population for the city of San Diego is 1,151,977 and the metropolitan area (San Diego County) estimated population is 2,644,132 (both estimates are for July 1, 1994, extrapolated from 1990 data). San Diego's major industries are aircraft, shipbuilding, and tuna fishing. Naval and marine installations provide employment for a large segment of the total work force. The water supply for the city of San Diego comes from a group of reservoirs in the mountainous areas of the county and two aqueducts from the Colorado River. The water treatment plants discharge effluent a significant distance offshore into the Pacific Ocean.

There are three naval facilities located on San Diego Bay. The Naval Station, San Diego is located on the mainland (eastern) side of San Diego Bay. The Naval Submarine Base, San Diego is located on the eastern side of Point Loma, immediately north of Ballast Point. It contains both fixed and floating piers and a floating drydock. The Naval Air Station/North Island, San Diego is on North Island in the center of San Diego Bay.

1.2 Survey History

San Diego Bay was previously surveyed by USEPA-NAREL in 1967 and 1986 (Ca67, Se89). During the 1967 and 1986 surveys, cobalt-60 (maximum of 17.4 pCi/g-dry in 1967, 0.05 pCi/g-dry in 1986) was found in some of the sediment samples, and was identified during the 1967 survey by the underwater probe. The cobalt-60 deposition reported in the 1967 survey was located in the area from Ballast Point northward to Shelter Island. The highest activities were detected in the immediate vicinity of the submarine pier, one of the berthing areas for the nuclear submarine tenders. The cobalt-60 deposition reported in the 1986 EPA survey was present in eight sediment samples from the Submarine Base and one sediment sample from near the sea wall at North Island.

1.3 Contaminants of Concern

The results of previous harbor surveys indicate that cobalt-60 is the predominant radionuclide one expects to find in environmental media if radioactivity is present as a result of Naval nuclear propulsion plant operations; therefore, environmental sampling during this study emphasized detection of cobalt-60 (Ca67, Se89). Other radionuclides of concern in liquid effluents or encountered during maintenance work include tungsten-187, chromium-51, hafnium-181, iron-59, iron-55, nickel-63, niobium-95, zirconium-95, tantalum-182, manganese-54, and cobalt-58. Water samples were also analyzed for tritium, a contaminant of concern, since it is known to be produced in the coolant of nuclear reactors. Analyses for uranium, thorium, plutonium, and radium were performed on a percentage of the samples from each media that showed the highest gross alpha and beta results. This was done to ensure that the source of any elevated gross alpha or beta activities was from naturally occurring nuclides or from fallout.

1.4 Study Objectives

The study objectives were to determine if radioactive material related to US Naval nuclear-powered warship operations, repair, and maintenance is present at measurable levels in the San Diego Harbor, to make comparisons of current study results with past study results and, as deemed necessary, to estimate potential doses to the public.

2.0 Sampling And Analysis

The following terms will be used in the discussion of the sampling plan:

Study Site(s):	The geographical area in and around San Diego Bay that was studied.
Sampling Location:	A location within or near one of the study sites from which samples were collected.
Background Location:	A selected sampling location where representative levels of naturally occurring or existing radionuclides were measured, but were not likely to be related to Naval Station, San Diego; Naval Submarine Base, San Diego; or Naval Air Station/North Island, San Diego.

2.1 Sampling Strategy

This study was designed to determine the concentrations of cobalt-60 and other radionuclides that could be present due to the operations performed at Naval Station, San Diego; Naval Submarine Base, San Diego; or Naval Air Station/North Island, San Diego. Sampling locations were selected to correspond to the locations where the Navy conducts environmental monitoring, locations where the USEPA-NAREL sampled in the 1986 survey of the study sites, and locations which were selected by the USEPA-NAREL to more comprehensively cover the study site (Table 1 and Fig. 1.0). In general, sampling locations were distributed so as to cover all likely locations of contamination.

Background sampling locations were selected in order to obtain baseline radionuclide levels that are characteristic of the area, but are believed not to have been affected by operations at the study sites. The data from the study site was compared directly to the background concentrations when applicable or to other standards, such as the drinking water regulations.

2.1.1 Sample Identification. The general scheme for identifying samples is y-xxx-yyyy-y-yy, where x is a number and y is a letter, as shown in the illustration below.

y	**xxx**	**yyy**	**y**	**yy**
Site	**Location**	**Medium**	**Duplicate Indicator**	**Background Indicator**
(S)	**(057)**	**(BBK)**	**(DUP)**	**(BG)**

As indicated parenthetically above, in a typical sample identified as S-057-BBK-DUP-BG, the S stands for San Diego Harbor; 057 is an assigned number identifying sample location; BBK identifies the sampled medium as a biota, brown kelp sample; DUP indicates that this is a duplicate (split); and BG indicates that the sample was taken at a background location. (Note.–All samples do not require the use of all 11 alphanumeric characters for identification.)

TABLE 1
Sample Locations

ID	Latitude[c]	Longitude[c]	'97	'86	'67	Sample Types[a]								Location[b]
S055	32°41.038' N	117°8.162' W	55	47			S							Naval Stn, Centered between Pier 1 and Pier to N, about 50 yards out from end of Pier 1
S054	32°41.091' N	117°7.897' W	54	44			S	C				W		Naval Stn, between Piers 1 & 2, even with southernmost large blue door of large building on wharf; 150 yards from wharf
S052	32°41.021' N	117°7.712' W	52	41			S							Naval Stn, N Side Pier 3
S002	32°40.775' N	117°7.777' W	2				S							Naval Stn, N side end of Pier 4
S118	32°40.739' N	117°7.658' W				DUP	S							Naval Stn, Middle between Piers 4 and 5
S104	32°40.727' N	117°7.488' W		30			S							Naval Stn, Beginning of Pier 5, S Side
S048	32°40.617' N	117°7.522' W	48	29			S	C				W		Naval Stn, Middle of Pier 6, N Side; centered on pier, 20 yards from the pier
S117	32°40.538' N	117°7.477' W					S							Naval Stn, Middle between Piers 6 and 7
S045	32°40.342' N	117°7.479' W	45	23			S							Naval Stn, N of Pier 8, Centered on pier, and 20 yards away from the Pier
S116	32°40.380' N	117°7.301' W					S							Naval Stn, S side beginning of Pier 8
S103	32°40.251' N	117°7.163' W		20			S							Naval Stn, S Side of Seventh St. Channel
S078	32°40.122' N	117°7.336' W	78	18			S							Naval Stn, S Side of Mole Pier
S102	32°40.122' N	117°7.256' W		17			S							Naval Stn, S Side of Mole Pier
S077	32°40.024' N	117°7.375' W	77				S							Naval Stn, S side end of Pier 10
S076	32°39.945' N	117°7.296' W	76	13			S	C				W		Naval Stn, Middle of Pier 11, S Side, even with 2nd cleat from pier terminus; 20 yards from pier
S075	32°39.818' N	117°7.387' W	75				S							Naval Stn, S side end of Pier 12
S074	32°39.642' N	117°7.363' W	74				S							Naval Stn, N side end of Pier 13
S073	32°39.408' N	117°7.193' W	73				S							Naval Stn, N side middle of Pier 14
S119	32°39.273' N	117°8.852' W				BG	S	C		B		W		Bkgd, Naval Stn, 100 yards S of wreck off of Pier H, S San Diego Bay
S03A	32°42.253' N	117°10.883' W	3A	48			S							North Island, Carrier Pier, even with oily waste burner
S01A	32°42.319' N	117°11.099' W	1A	50		DUP	S							North Island, Carrier Pier, even with shore power mound # 2050, 20 yards from pier
S02B	32°42.396' N	117°11.337' W	2B	52			S							North Island, Carrier Pier, even with last shore power mound on West end of pier
S114	32°42.501' N	117°11.264' W					S							North Island, Middle of new sea wall for carrier dock
S115	32°42.506' N	117°11.009' W					S					W		North Island, middle of turning basin
S059	32°42.817' N	117°11.401' W	59	55			S							North Island, Lima Pier, N Side, 20 yards away from pier
S058	32°42.697' N	117°11.309' W	58	54			S	C				W		North Island, Lima Pier, N Side, even with Eastern end, 20 yards away from pier
S140	32°42.764' N	117°11.462' W							L				E	North Island, Shoreline, Lima Pier
S139	32°42.826'N	117°11.842'W				DUP			L				E	North Island, Shoreline, Depot Maintenance Facility
S137	32°42.787'	117°12.415' W							L				E	North Island, Shoreline, Northern Shore
S136	32°42.604' N	117°12.969' W							L				E	North Island, Shoreline, Northern Shore

TABLE 1 - *Continued*

ID	Latitude[c]	Longitude[c]	'97	'86	'67	Sample Types[a]								Location[b]
S135	32°42.153' N	117°13.484' W							L				E	North Island, Shoreline, North of Bravo Weapons Pier
S081	32°41.640' N	117°13.687' W	81				S					W		North Island, off of Bravo Pier Weapons area
S133	32°41.111' N	117°13.169' W				BG			L				E	Bkgd, North Island, Shoreline, Zuñiga Point, Nearest Beach Access
S120	32°40.244' N	117°13.405' W				BG	S	C		B		W		Bkgd, Zuñiga Point
S121	32°40.240' N	117°14.170' W				BG	S	C		B		W		Bkgd, Point Loma
S129	32°40.241' N	117°14.243' W				BG			L				E	Bkgd, Point Loma, Sub Base Shoreline
S027	32°41.132' N	117°14.107' W	27	69	13		S	C				W		Sub Base, Ballast Point, W Side; lying on a line using the Coast Guard Pier and Tennis Courts as end points, 5 yards from CG Pier and 20 yards from beach
S128	32°41.087' N	117°14.087' W				DUP			L				E	Sub Base, Shoreline, S shore Ballast Point
S130	32°41.125' N	117°14.152' W							L				E	Sub Base, Shoreline, N side Ballast Point
S109	32°41.269' N	117°14.023' W		68			S							Sub Base, Middle of Sierra Pier, S Side, outboard of floating drydock
S113	32°41.272' N	117°13.966' W					S							Sub Base, S off end of Sierra Pier
S108	32°41.317' N	117°13.980' W		67	9	DUP	S							Sub Base, End of Sierra Pier
S084	32°41.315' N	117°14.023' W	84	66	7		S							Sub Base, lying on a line using the terminus of Mike and Sierra Piers
S025	32°41.223' N	117°14.198' W	25	65	10	DUP	S	C		B		W		Sub Base, Between Mike and Sierra Pier
S107	32°41.252' N	117°14.229' W		64	4		S							Sub Base, Between Mike and Sierra Pier
S023	32°41.372' N	117°14.026' W	23	61	6		S							Sub Base, S Side of Mike Pier, 5 yards from pier, 25 yards East of terminus of pier
S106	32°41.401' N	117°14.031' W		63	8		S							Sub Base, End of Mike Pier
S019	32°41.408' N	117°14.071' W	19	60	1		S							Sub Base, N Corner of Mike Pier, at pier terminus
S021	32°41.377' N	117°14.170' W	21	59	2	DUP	S	C		B		W		Sub Base, N Side of Mike Pier
S020	32°41.333' N	117°14.275' W	20	58	3		S							Sub Base, N Side of Mike Pier
S131	32°41.328' N	117°14.323' W							L				E	Sub Base, Shoreline, between Mike and November Piers
S105	32°41.396' N	117°14.241' W		56			S							Sub Base, Middle of November Pier S Side
S112	32°41.424' N	117°14.150' W					S							Sub Base, S off end of November pier
S101	32°41.456' N	117°14.125 W		4			S							Sub Base, Off End of November Pier
S100	32°41.458' N	117°14.165' W		3			S							Sub Base, End of November Pier, W Side
S063	32°41.446' N	117°14.207' W	63	2			S	C		B		W		Sub Base, November Pier, N Side from pier terminus
S111	32°41.641' N	117°14.306' W		74	20		S	C		B		W		Sub Base, Corner of Degaussing Pier
S110	32°41.706' N	117°14.296' W		73			S							Sub Base, End of Degaussing Pier
S082	32°41.694' N	117°14.148' W	82	71			S	C		B		W		Sub Base, E of Floating Piers; degaussing pier, E Side
S132	32°41.634' N	117°14.395' W							L				E	Sub Base, Shoreline, S of Degaussing Pier
S134	32°41.703' N	117°14.400' W							L				E	Sub Base, Shoreline, N of Degaussing Pier
S080	32°42.075' N	117°14.192' W	80				S							Sub Base, off of center of fueling dock

TABLE 1 - *Continued*

ID	Latitude[c]	Longitude[c]	'97	'86	'67	Sample Types[a]								Location[b]
S138	32°39.279' N	117°8.891' W				BG			L				E	Bkgd, Coronado, Shoreline
S122	32°40.740' N	117°13.843' W					S							Sub Base, first Channel Marker, inside Channel
S123	32°41.774' N	117°13.865' W					S							Sub Base, Second Channel Marker, inside Channel (R-14)
S124	32°42.333' N	117°13.713' W					S							Shelter Island, third Channel Marker, inside Channel (G-17)
S125	32°42.892' N	117°13.082' W				DUP	S							Shelter Island, fourth Channel Marker, inside Channel
S126	32°43.017' N	117°12.304' W					S							North Island, fifth Channel Marker, inside Channel (R-20)
S127	32°43.131' N	117°11.623' W					S							North Island, sixth Channel Marker, inside Channel
S141	32°43.825' N	117°11.938' W				BG					D			Bkgd, Lindbergh Field (Airport), Drinking Water, Commuter Terminal
S142	32°42.566' N	117°14.317' W				BG					D			Bkgd, Pt. Loma Inn (Hotel), Drinking Water[d]
S143	32°42.955' N	117°9.451' W				BG					D			Bkgd, San Diego City, Drinking Water, CMC Ice Co.
S144	32°41.078' N	117°14.170' W				DUP					D			Sub Base, Drinking Water, BOQ Laundry Room
S145	32°42.178' N	117°11.207' W									D			North Island, Drinking Water, Last Chance Gedunk at J and K Pier
S146	32°40.718' N	117°7.206' W									D			Naval Stn, Drinking Water
S147	32°39.490' N	117°7.330 W											E	32nd St. Boundary South Between 14 and Marine Pier
S148	32°41.150' N	117°8.240' W											E	32nd St. Boundary off Pier 1
S149	32°41.020' N	117°14.090' W											E	Pt. Loma Boundary off shore
S150	32°43.600' N	117°13.660' W				BG					D			Bkgd, Pt. Loma, KFC (Kentucky Fried Chicken restaurant), Corner of Rosencranz and Ingelow[d]

[a] Type of biota collected depended on availability. Several biota samples were collected at most sites. "DUP" and "BG" indicate duplicate and background sites, respectively. Duplicate means two of the same type of samples were taken from the same location and were analyzed separately. All sample types taken at each location are indicated.
[b] Where distance is not specified, samples were taken as close to piers as situations permitted. When barges, ships, or other impediments prevented sampling at a specified location, the sample was collected as close as possible to the specified location and the alternate location was noted.
[c] Each location is identified by a unique location ID. Latitude and longitude were determined by Geographic Positioning System (GPS) units, with a typical accuracy of about 10 meters 2-Distance Root Mean Square (DRMS), and were verified using NOAA nautical charts. Corresponding locations used by the Navy, the EPA 1986 survey (Se89), and the EPA 1967 survey (Ca67) are indicated where appropriate.
[d] The drinking water background for Point Loma was collected twice. Results for The Kentucky Fried Chicken restaurant sample and the Point Loma Inn sample are shown in the Appendix as S-142-D-BG and S-150-D-BG, respectively.

NOTE.–Columns headed '97, '86, and '67 refer to location ID's used by the Navy in 1997, the EPA in the study done in 1986, and the EPA in the study done in 1967.

2.1.2 Abbreviations

Sample Locations:

S	Prefix for sampling location at San Diego Harbor.
S-0xx	Format for sites sampled by the Navy at San Diego Harbor.
S-1xx	Format for sites selected by USEPA-NAREL and NOT currently sampled by the Navy at San Diego Harbor.

Sample Type:

S	Harbor sediment (surface of harbor bottom)
C	Sediment core
W	Surface water from harbor
D	Drinking water
L	Shoreline sediment at low tide
BG	Suffix for sample location that is a background location
DUP	Duplicate
E	External measurement
B	Biota

Biota Suffixes:

Bxxx	Suffix in a sample identifier that designates that the sample is marine biota,
BBSK	Biota, brown split kelp
BBK	Biota, brown kelp
BBPS	Biota, black pine seaweed
BC	Biota, crab
BSP	Biota, sponge
BSC	Biota, sea cucumber
BSF	Biota, starfish

2.1.3 Background Locations

The background locations selected were Point Loma Park, Zuñiga Point, and the South San Diego Bay (Table 1 and Figs. 2.0 - 8.3). The locations for the background samples were selected during the pre-survey visit to the study sites and were located at a distance far enough away from the study sites so that operations there would not have impacted those locations. Therefore, representative levels of existing radionuclides in the samples as a result of natural radioactivity and worldwide fallout, from atmospheric nuclear tests or the Chernobyl reactor accident in 1986, could be measured.

2.1.4 Study Sites

The Naval Station, San Diego study site is located on the mainland (eastern) side of San Diego Bay. The Naval Submarine Base, San Diego study site is located on the eastern side of Point Loma, immediately north of Ballast Point. The Naval Air Station / North Island, San Diego study site is located on North Island in the center of San Diego Bay. A description of each sampling location and the type of sample collected are presented in Table 1 and shown in Figs. 2.0 - 7.2.

2.2 Instrumentation

At selected locations, radiation surveys were performed using portable survey instruments to detect gamma radiation. External radiation measurement locations are presented in Table 1 and shown in Figs. 8.0 - 8.3. External gamma radiation was measured with an Eberline E-600 radiation survey instrument with a SPA-6 2"x 2" NaI(Tl) scintillation gamma probe, a GENITRON GM survey instrument, and a Reuter-Stokes pressurized ionization chamber. Underwater measurements of gamma radiation were performed using a 4.5" x 5" NaI(Tl) detector and an EG&G ORTEC Nomad Plus-based multichannel analyzer. Instrument serial numbers and calibration dates are available on the field data sheets.

2.3 Collection of Samples and Analysis

Intertidal sediment (basically the same as soil), harbor bottom sediment (grab and core), water, and biota were collected. By previous agreement between USEPA-NAREL and the Navy, most samples were split for routine independent comparisons by the Navy. Lists of the samples collected from San Diego Bay are included in Table 1. For approximately 5% of each type of sample, a quality control duplicate sample was collected; the duplicate (co-located) samples are included in the referenced tables. All samples were analyzed for gross alpha and beta activities and gamma-emitting radionuclides. Some of the samples were also analyzed for radium-226 and isotopes of uranium, plutonium, and thorium.

Several changes to the proposed sampling locations (see EPA 97a) were necessary due to the limited availability of certain sample types at the proposed locations. Biota samples were not available in sufficient quantity at locations S-027, S-048, S-054, S-058, and S-076. Location S-058 was designated as a duplicate site, but, due to limited availability of sediment and biota, this location was dropped as a duplicate location for all sample types. Locations S-025 and S-021 were added as duplicate locations for all sample types. Location S119 was moved from Crown Cove to a location further into the bay due to insufficient availability of biota samples. The new location is 100 yards south of the shipwreck in the middle of the South San Diego Bay off of Naval Station Pier 14.

Surface water samples were collected by lowering a Wildco horizontal alpha bottle to a depth of three feet and then closing the bottle by releasing a "messenger" which activated a tripping mechanism. This process was repeated until 4.5 L of water was obtained. About 4 L of

water was poured into a plastic sample container and acidified to a pH of <2.0 with nitric acid. The acidified water sample was analyzed for gross alpha and beta activities and gamma-emitting radionuclides. Some of the samples were also analyzed for radium-226 and isotopes of uranium, plutonium, and thorium. One half liter of the water sample was poured into a glass container but was not acidified. This sample was analyzed for tritium. Seventeen surface water samples were collected during the study. There were no visible solids in any of the water samples, so it was not necessary to filter any of the water samples.

Drinking water samples were collected from seven taps representing the water supplies of the Naval Station, San Diego, the Naval Submarine Base, San Diego, and the Naval Air Station/North Island, San Diego. The 4.5 L drinking water sample was divided into two sample containers that were prepared and analyzed in the same manner as the surface water samples.

Seventy-seven harbor sediment and shoreline sediment samples were obtained during this study. Harbor sediment samples were collected from boats using a Peterson dredge to sample approximately the top 10 centimeters of sediment. Shoreline sediment samples were collected with a small trowel. Fifteen sediment core samples were also collected to evaluate the distribution of radioactivity in harbor bottom sediment. Core samples were collected by divers who pushed two-inch diameter plastic tubes into the sediment as far as possible and then capped the ends. The cores were frozen and sectioned in up to five segments per core, with each segment having a minimum length of 5 centimeters.

Fifteen biota samples were collected at 13 sites. All biota samples were collected by divers. The predominant species, both plant and animal, were collected at each location.

Fig. 2.0. SURFACE WATER SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 2.1, 2.2, 2.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

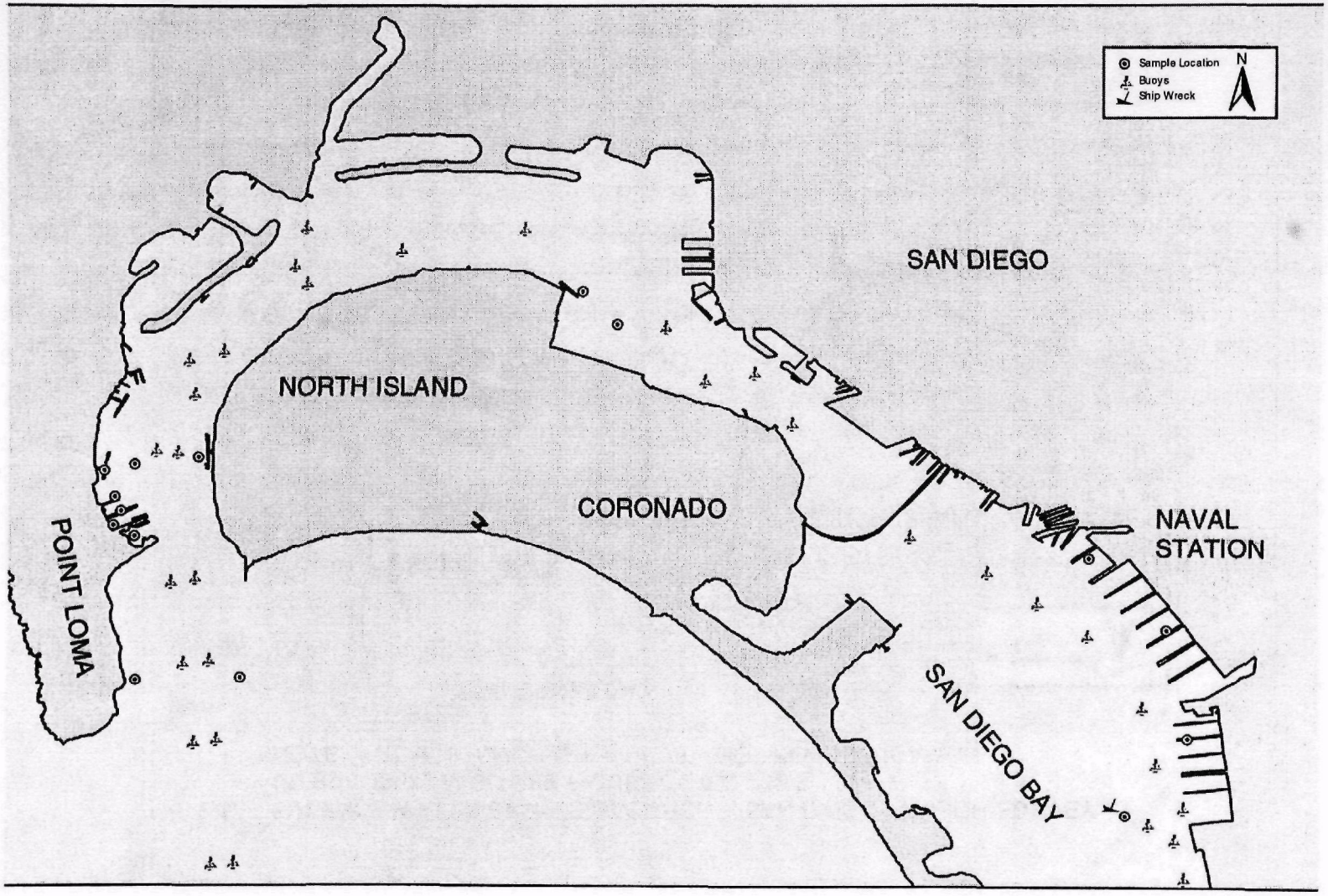


Fig. 2.1. SURFACE WATER SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 2.0, 2.2, 2.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

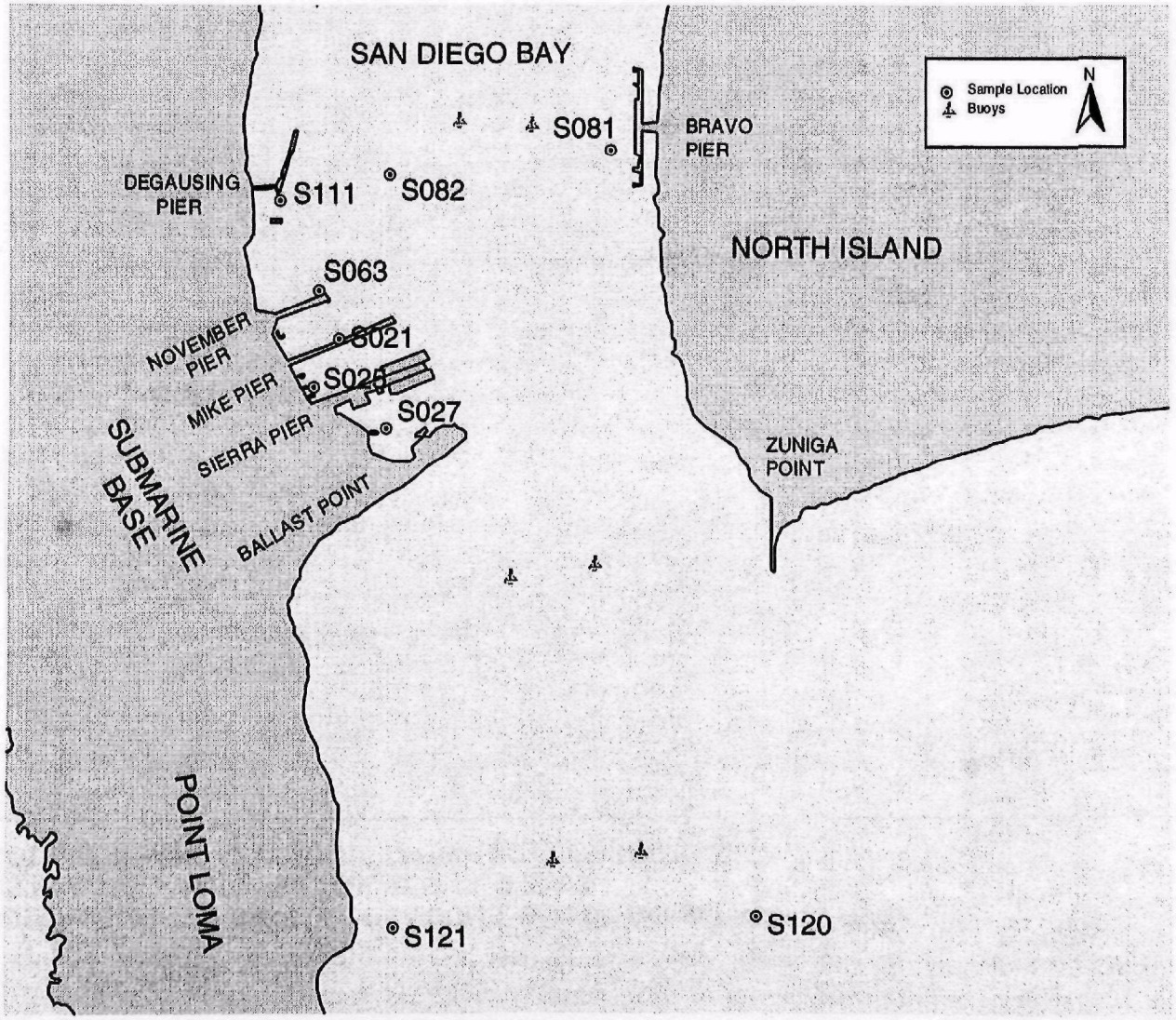


Fig. 2.2. SURFACE WATER SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 2.0, 2.1, 2.3
NOTE: FROM NOAA CHART #18773 - NOT FOR NAVIGATION.

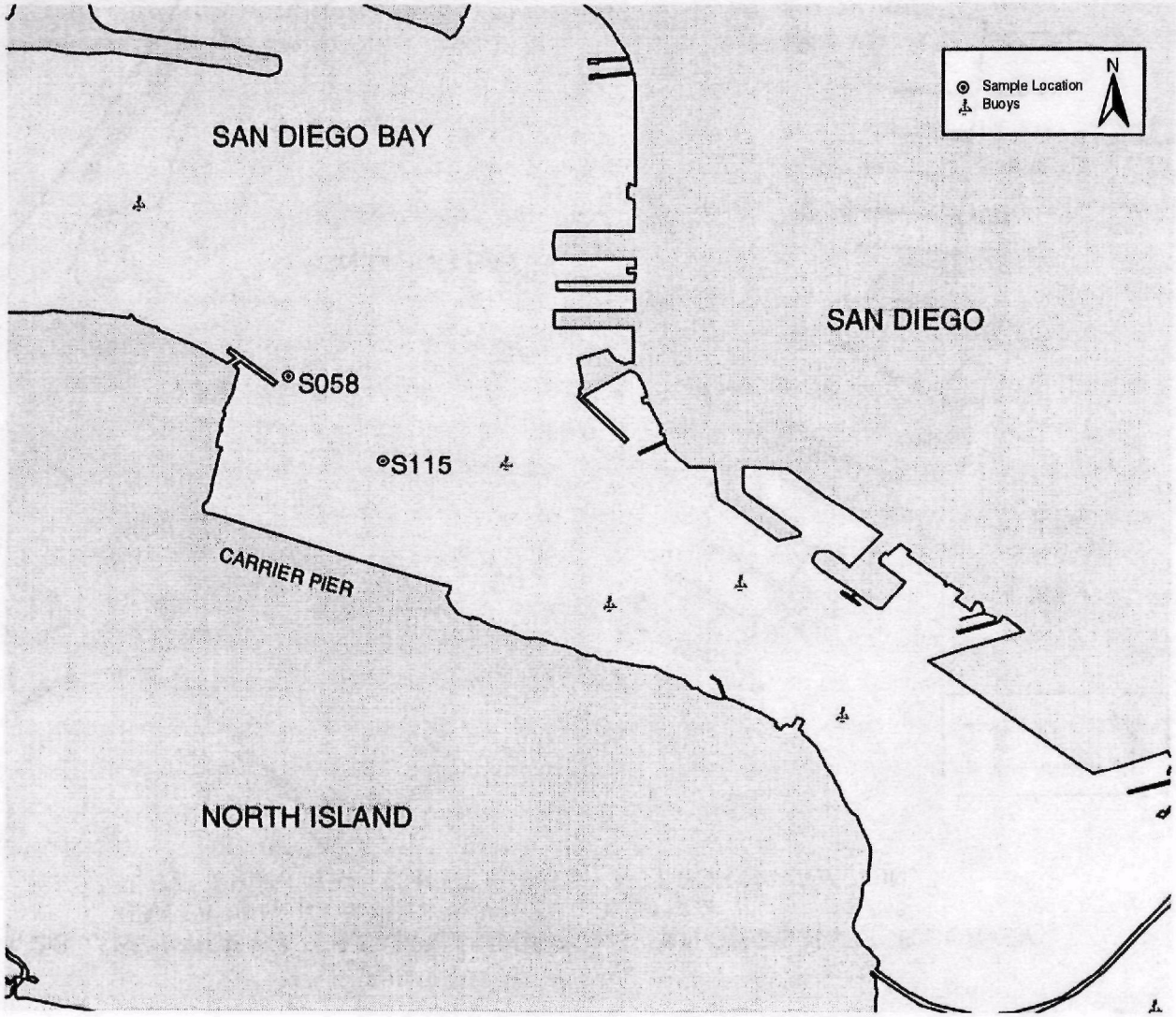


Fig. 2.3. SURFACE WATER SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 2.0, 2.1, 2.2
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

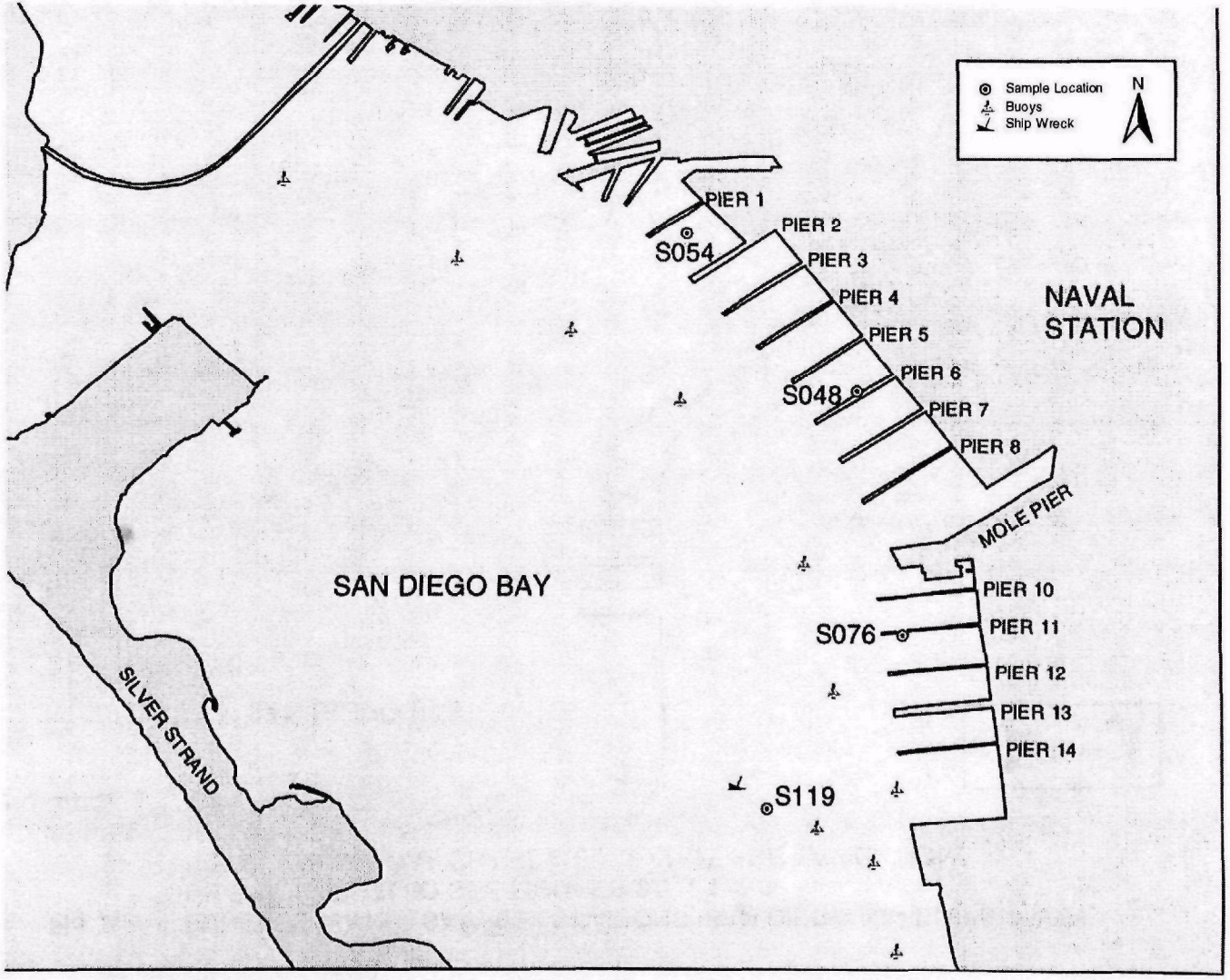


Fig. 3.0. DRINKING WATER SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURE 3.1
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

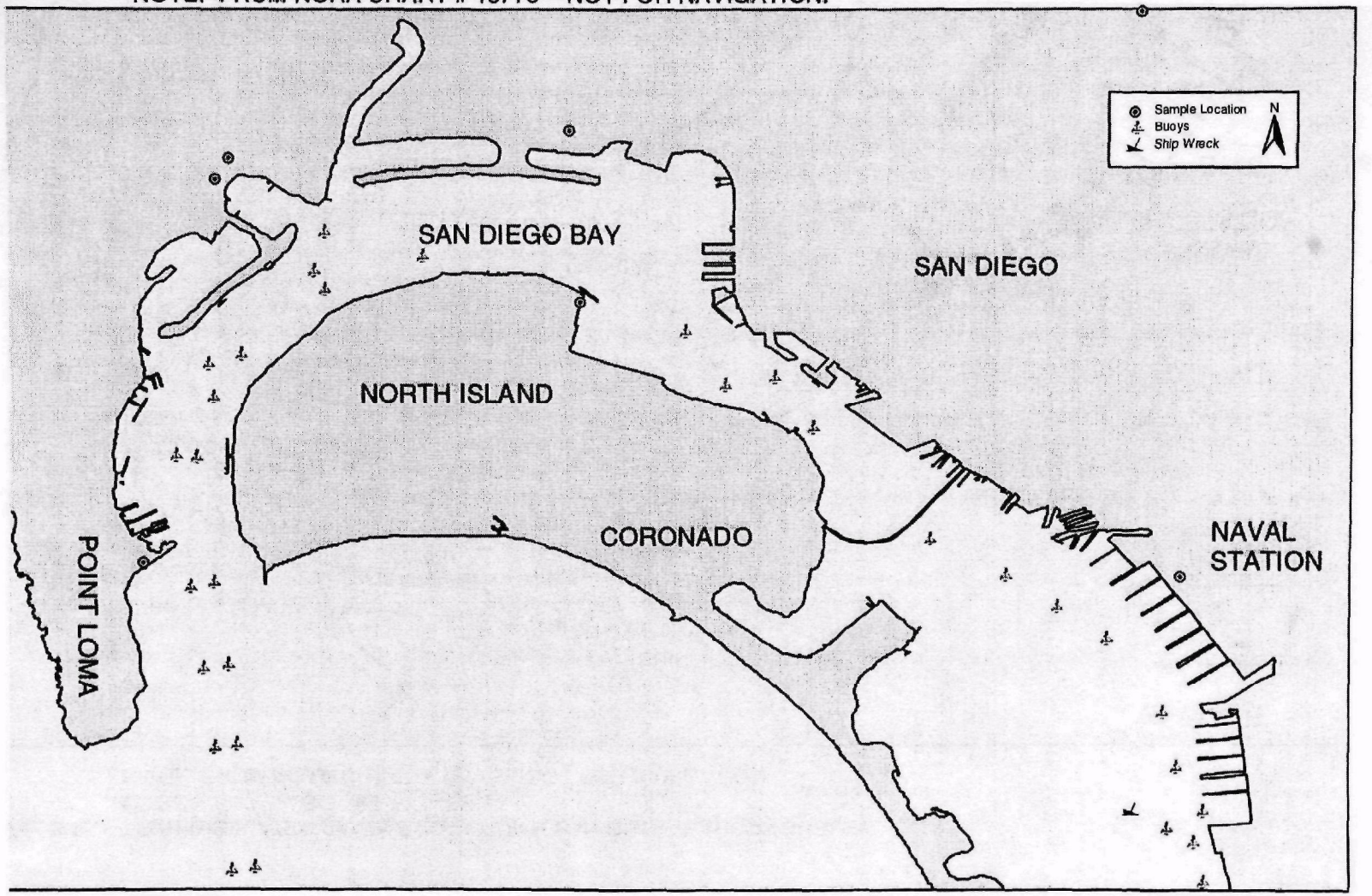


Fig. 3.1. DRINKING WATER SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURE 3.0
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

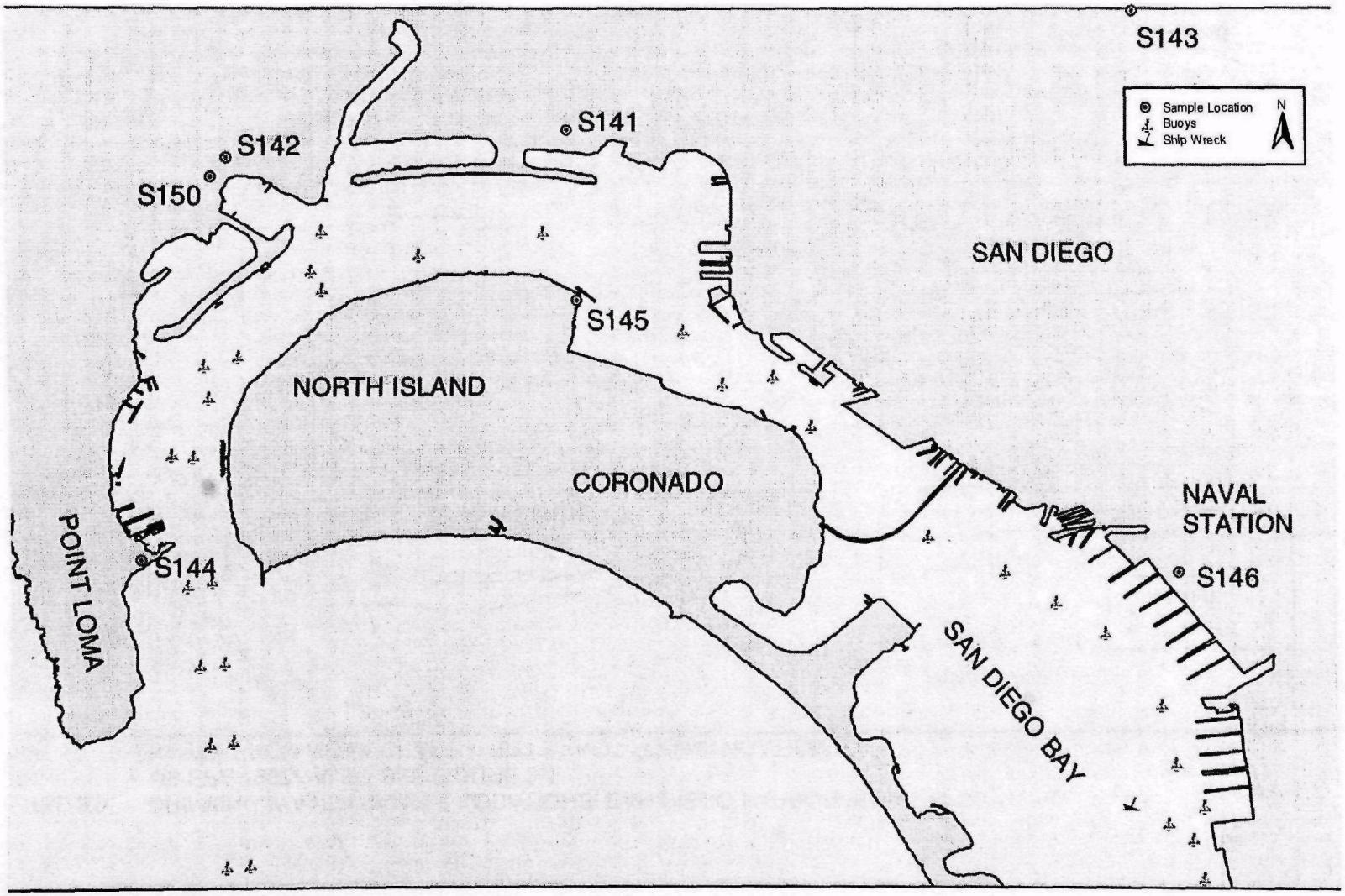


Fig. 4.0. HARBOR SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 4.1, 4.2, 4.3, 4.4
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

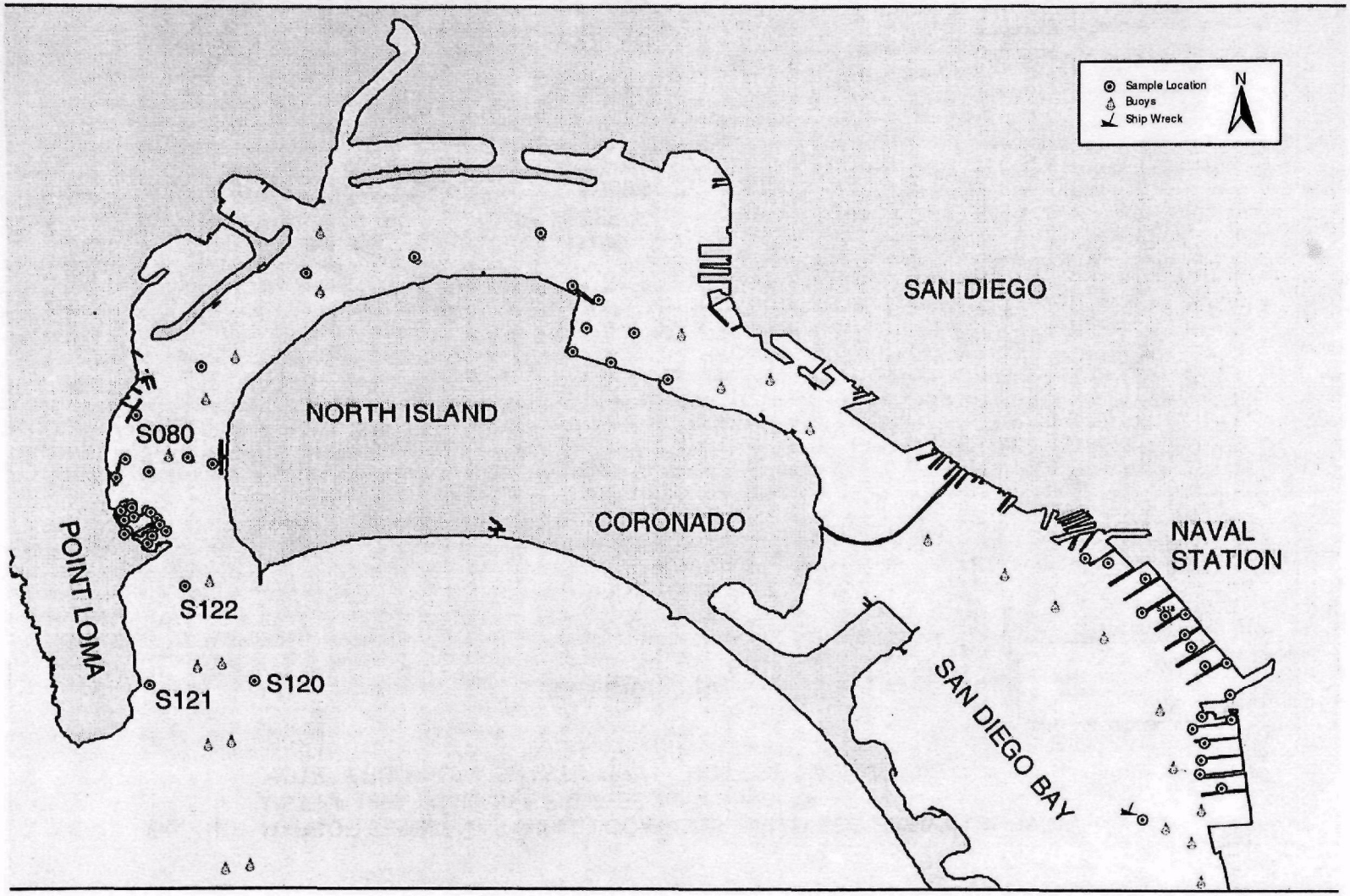


Fig. 4.1. HARBOR SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 4.0, 4.2, 4.3, 4.4
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

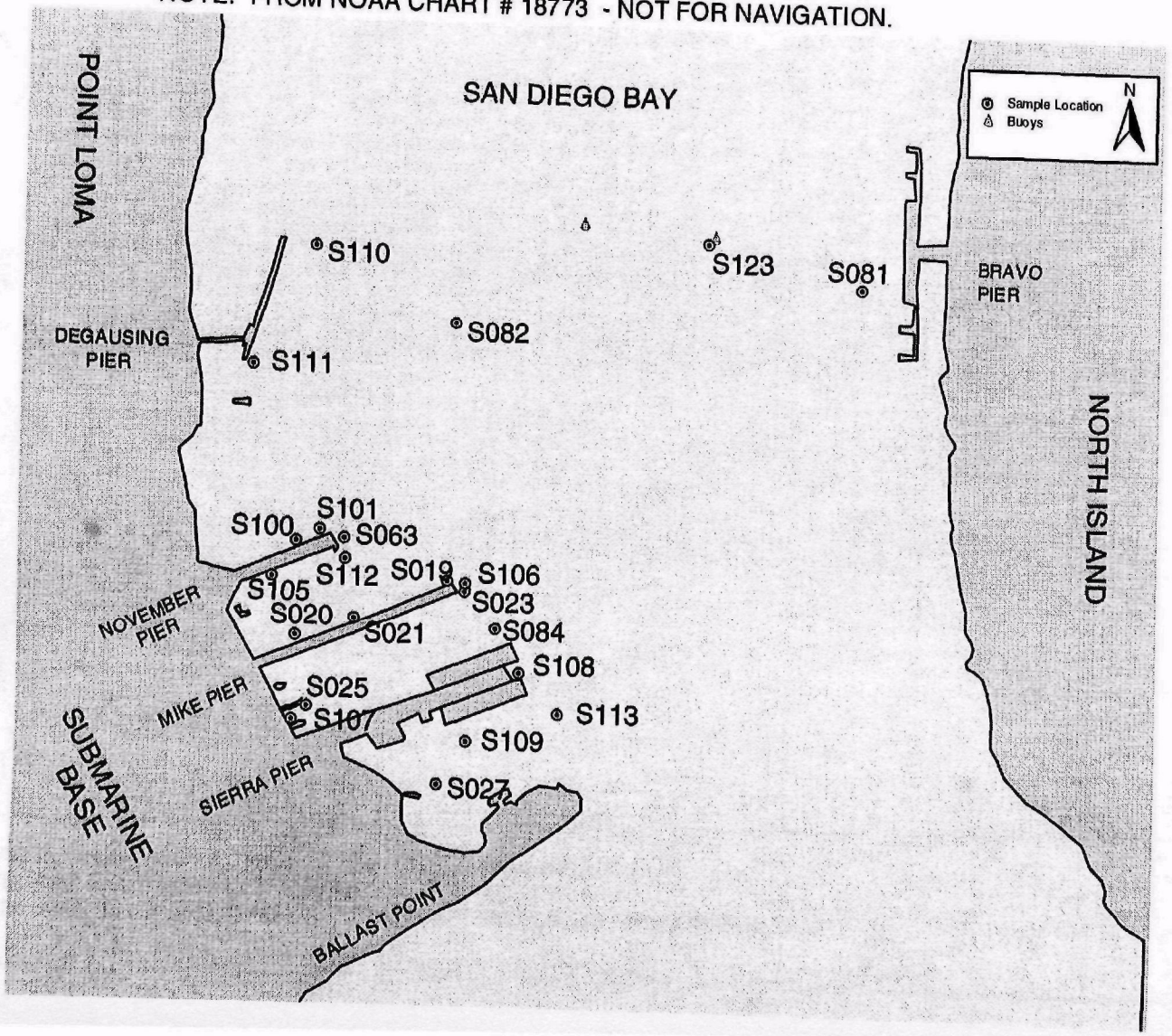


Fig. 4.2. HARBOR SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 4.0, 4.1, 4.3, 4.4
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

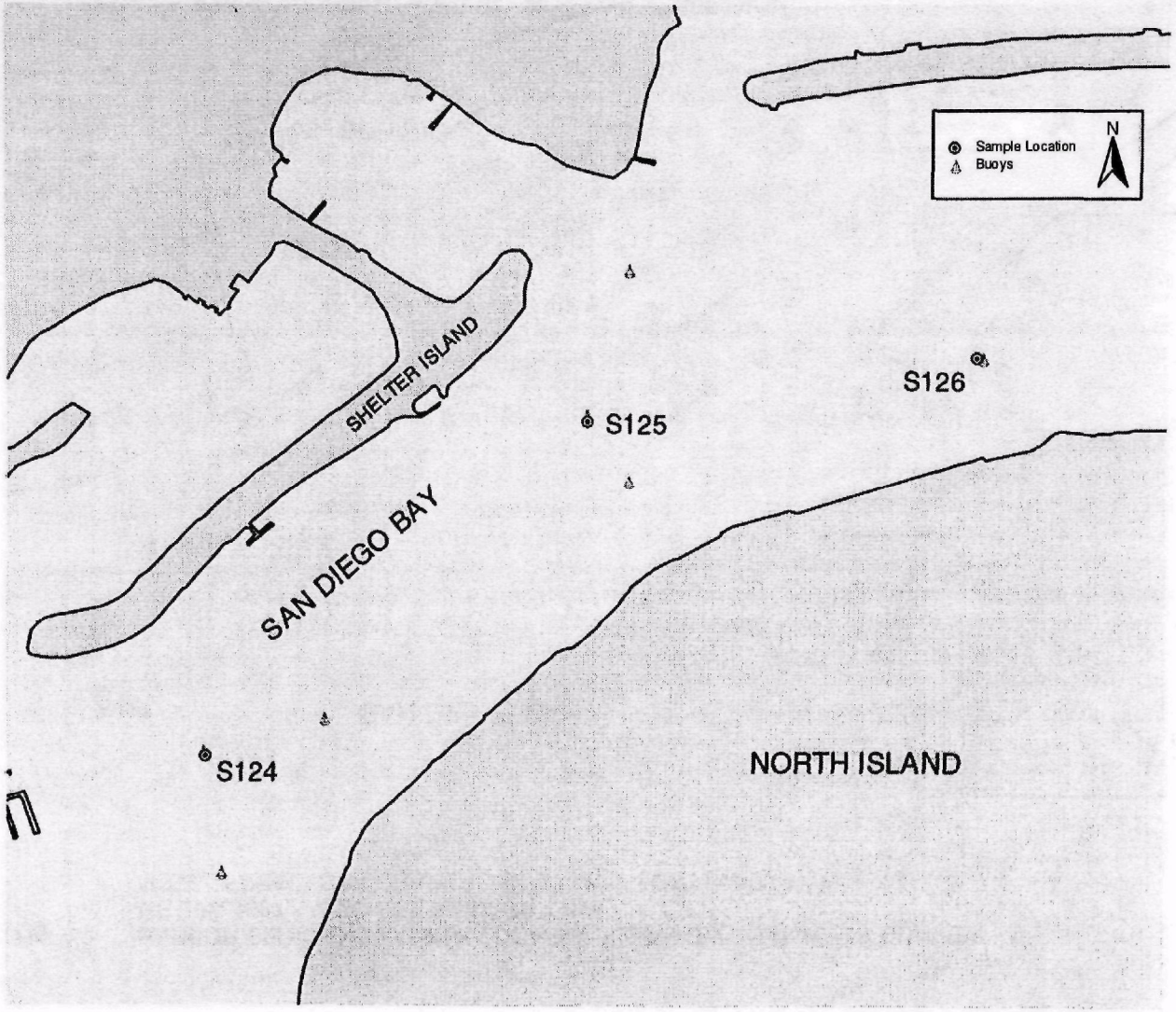


Fig. 4.3. HARBOR SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 4.0, 4.1, 4.2, 4.4
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

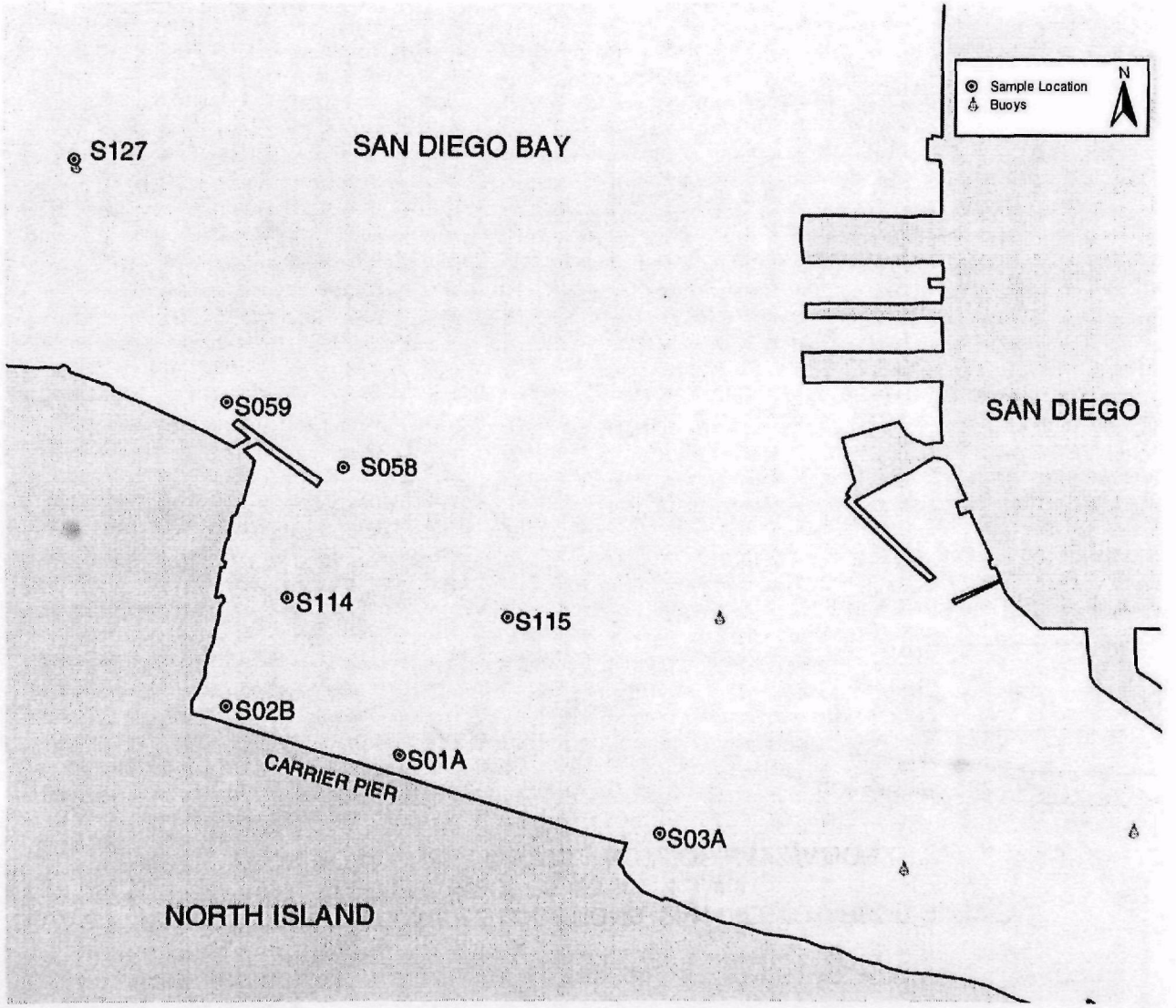


Fig. 4.4. HARBOR SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 4.0, 4.1, 4.2, 4.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

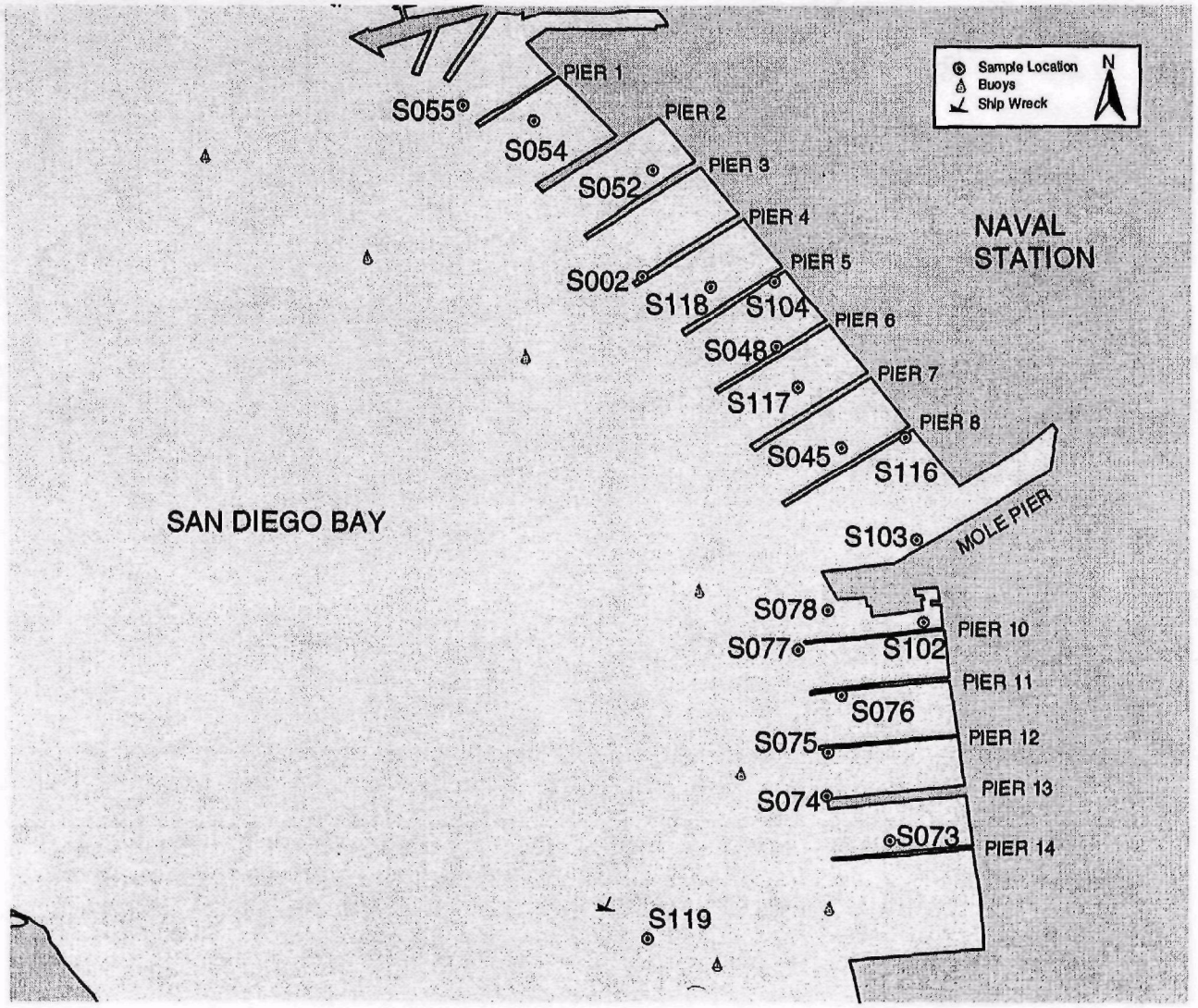


Fig. 5.0. SHORELINE SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 5.1, 5.2, 5.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

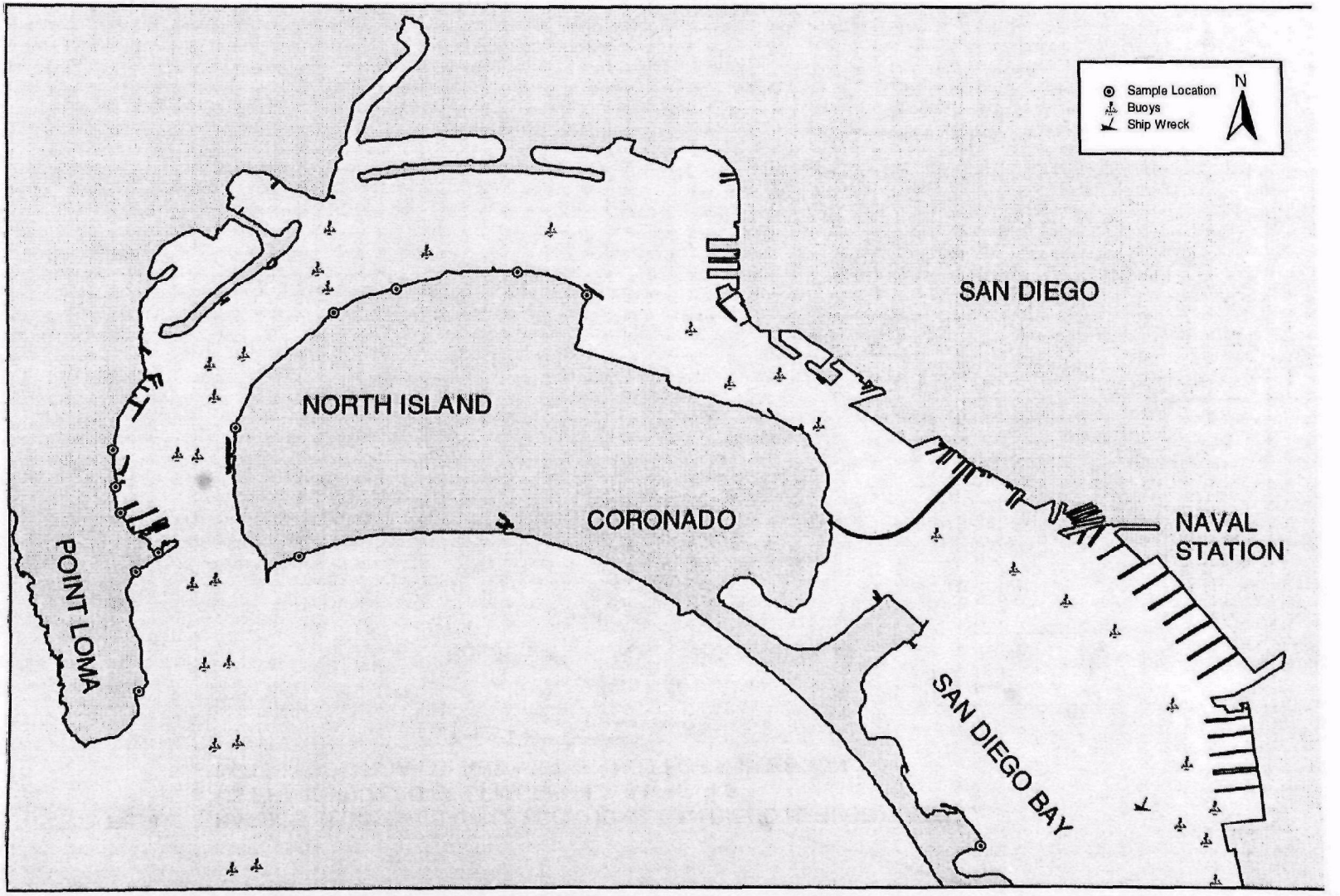


Fig. 5.1. SHORELINE SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 5.0, 5.2, 5.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

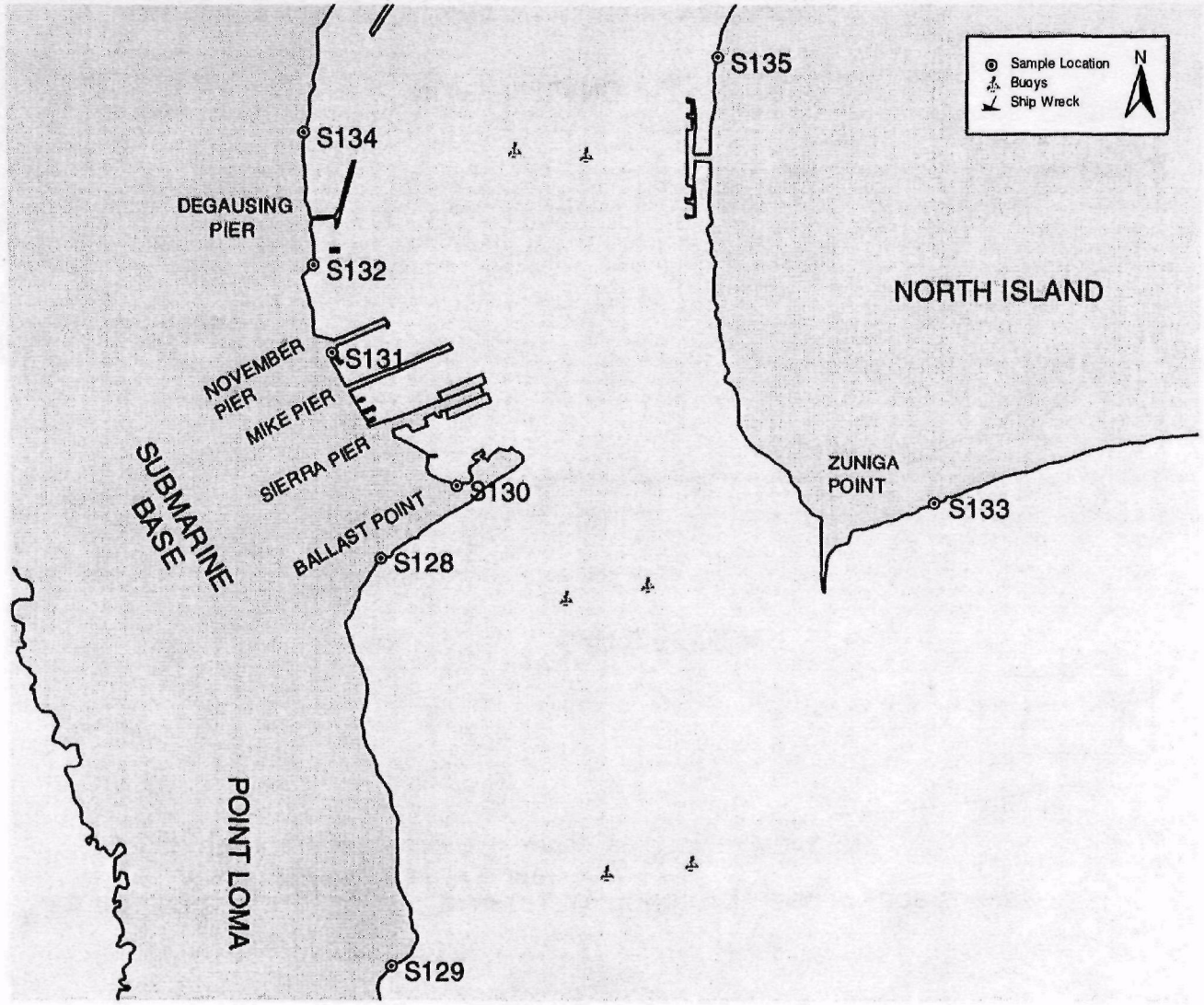


Fig. 5.2. SHORELINE SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 5.0, 5.1, 5.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

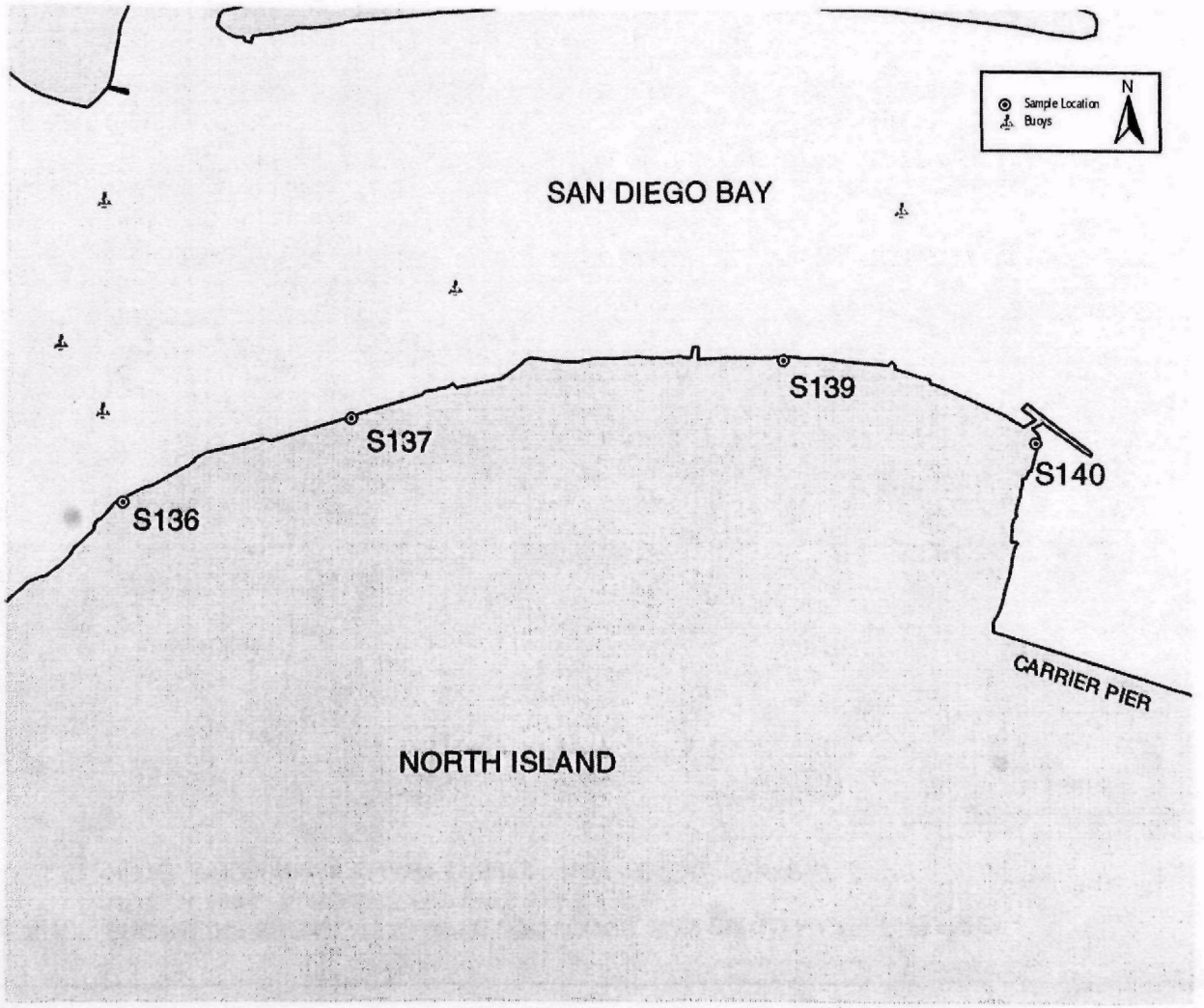


Fig. 5.3. SHORELINE SEDIMENT SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 5.0, 5.1, 5.2
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

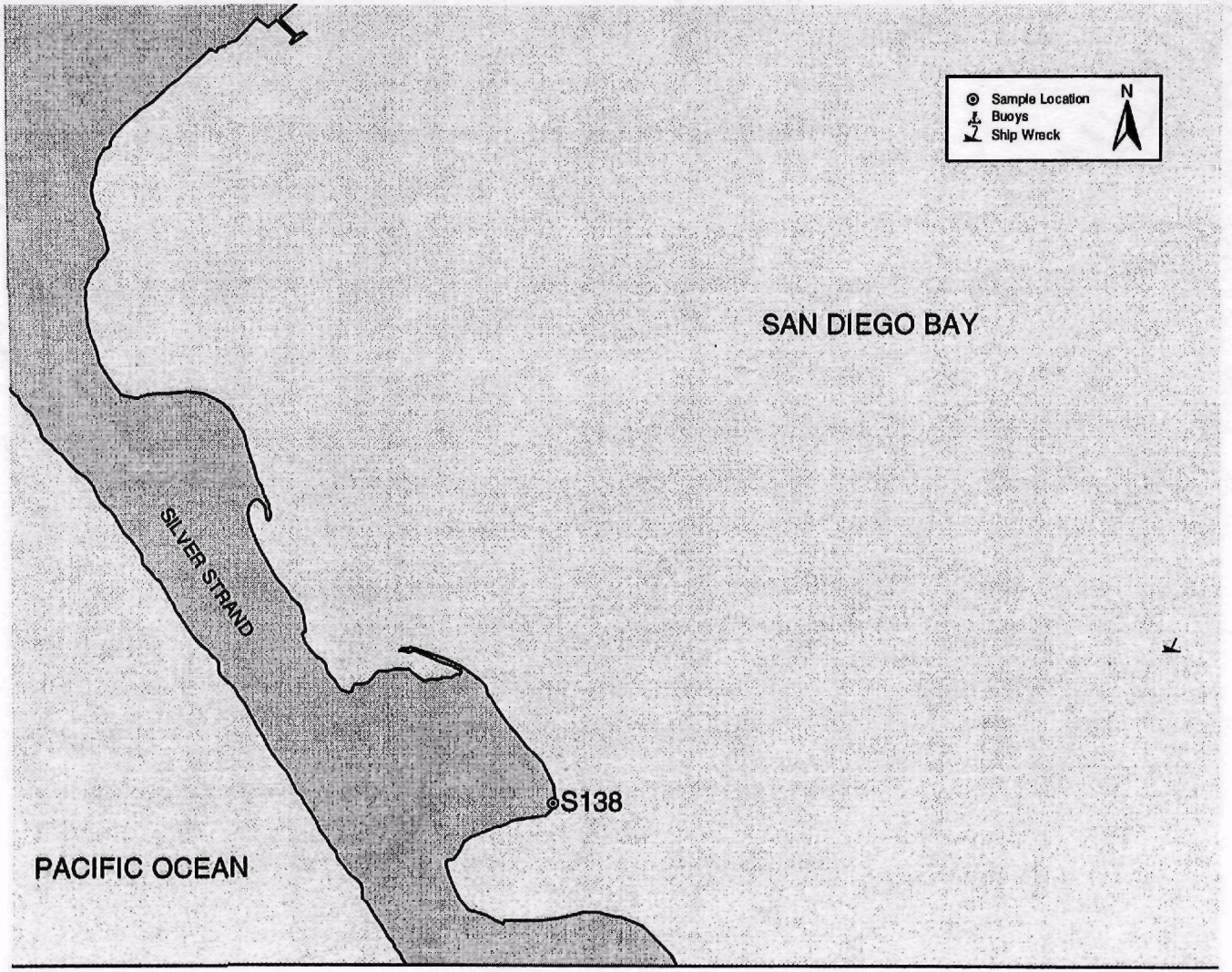


Fig. 6.0. CORE SAMPLING LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 6.1, 6.2, 6.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

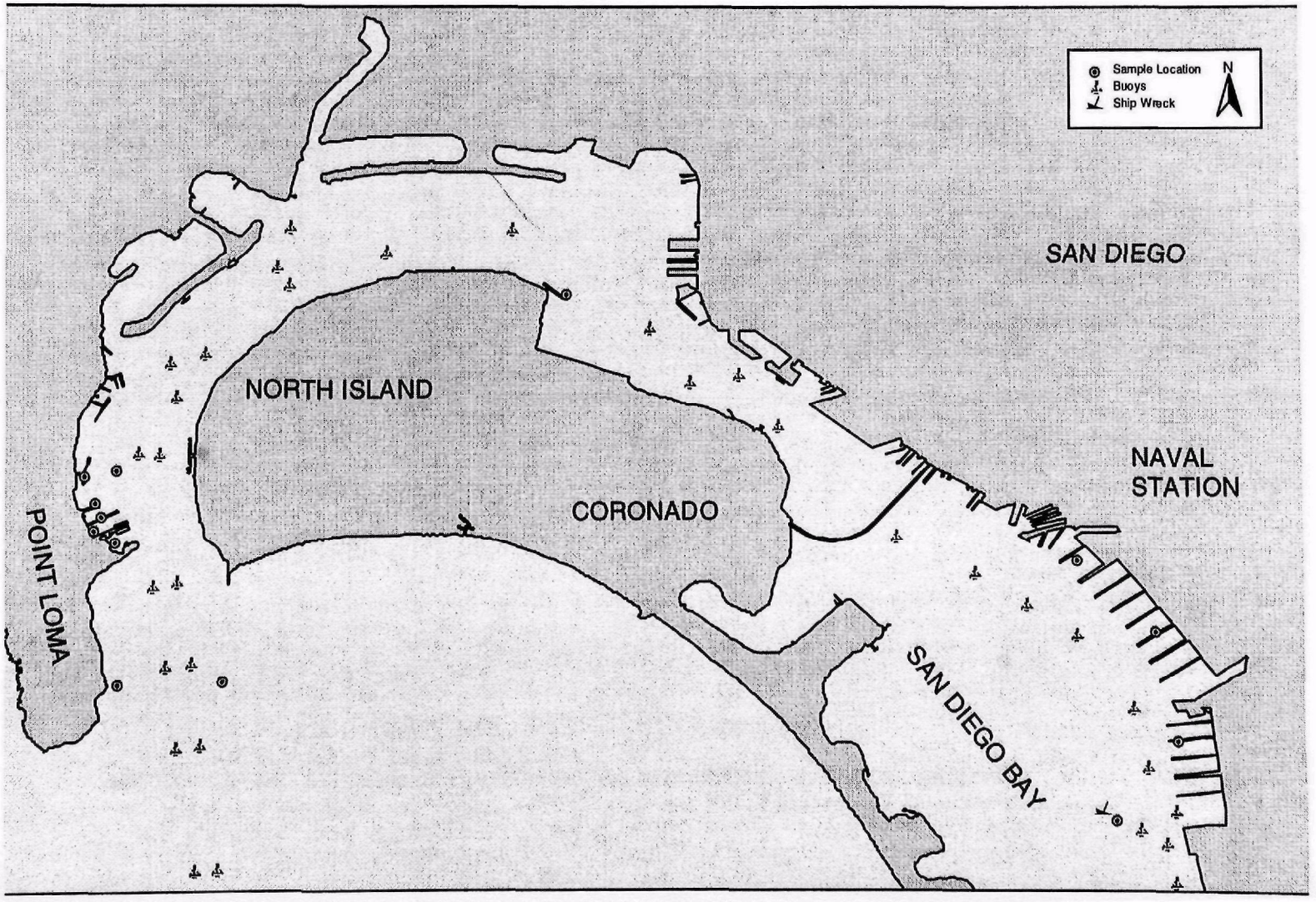


Fig. 6.1. CORE SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 6.0, 6.2, 6.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

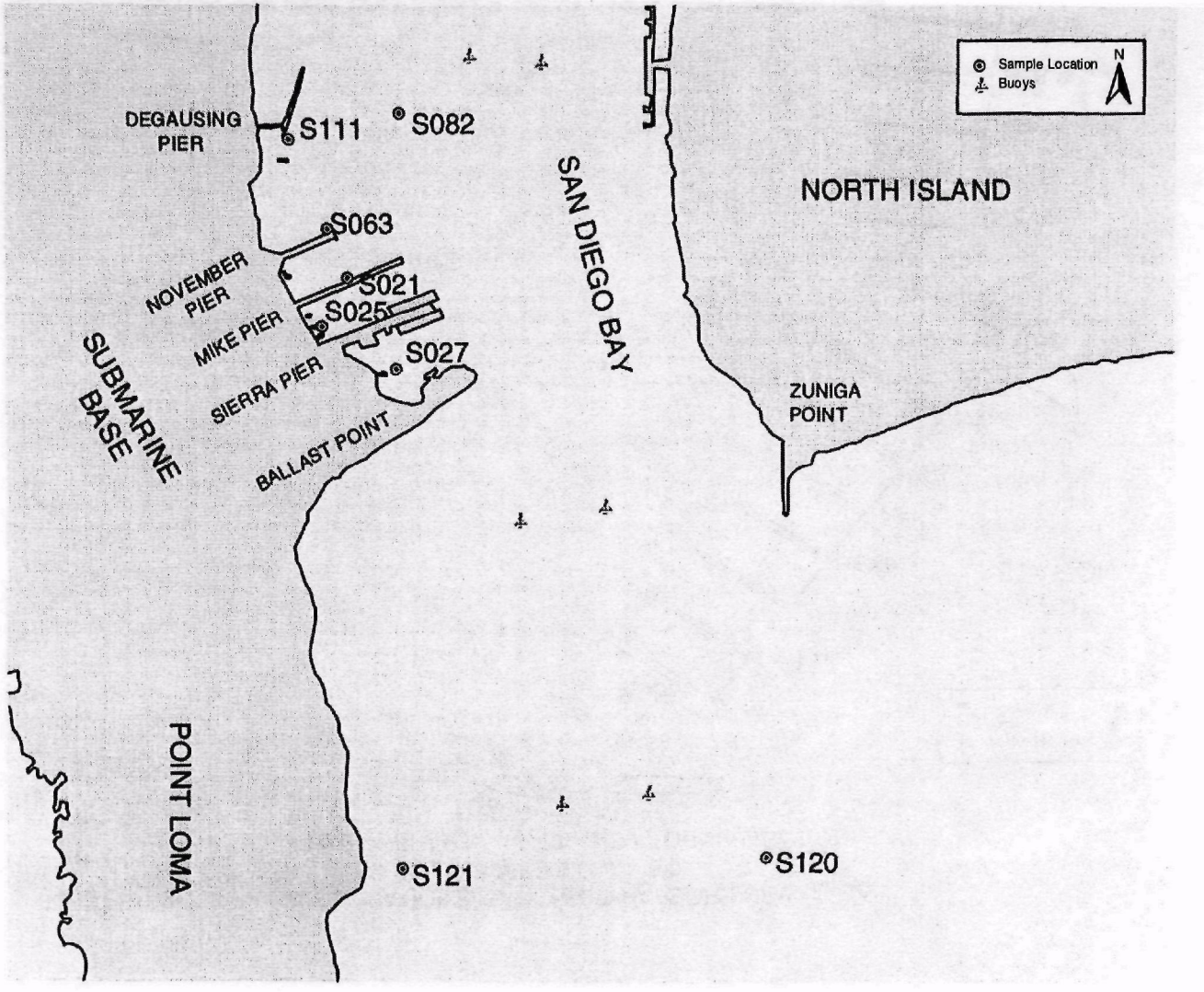


Fig. 6.2. CORE SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 6.0, 6.1, 6.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

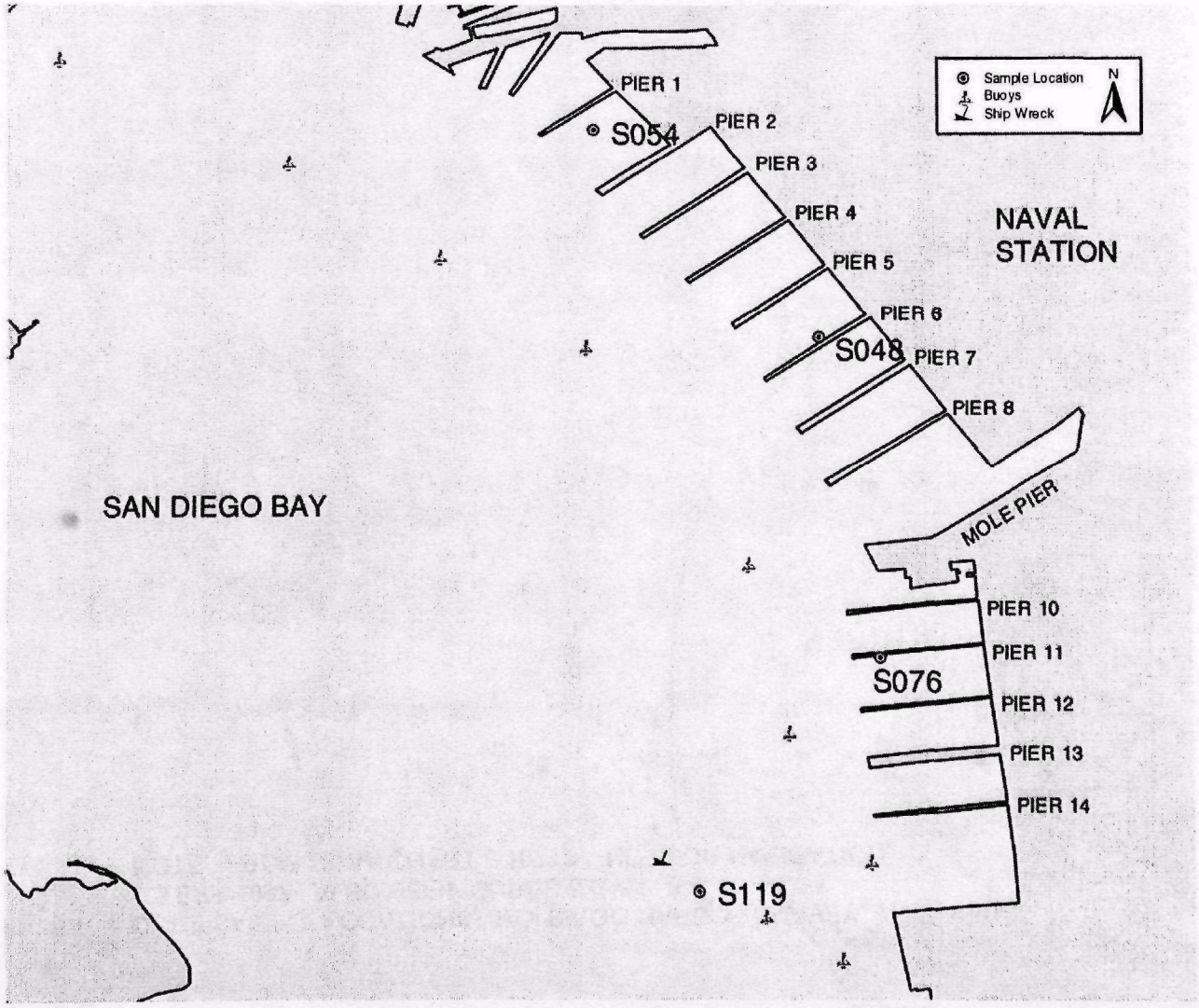


Fig. 6.3. CORE SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 6.0, 6.1, 6.2
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

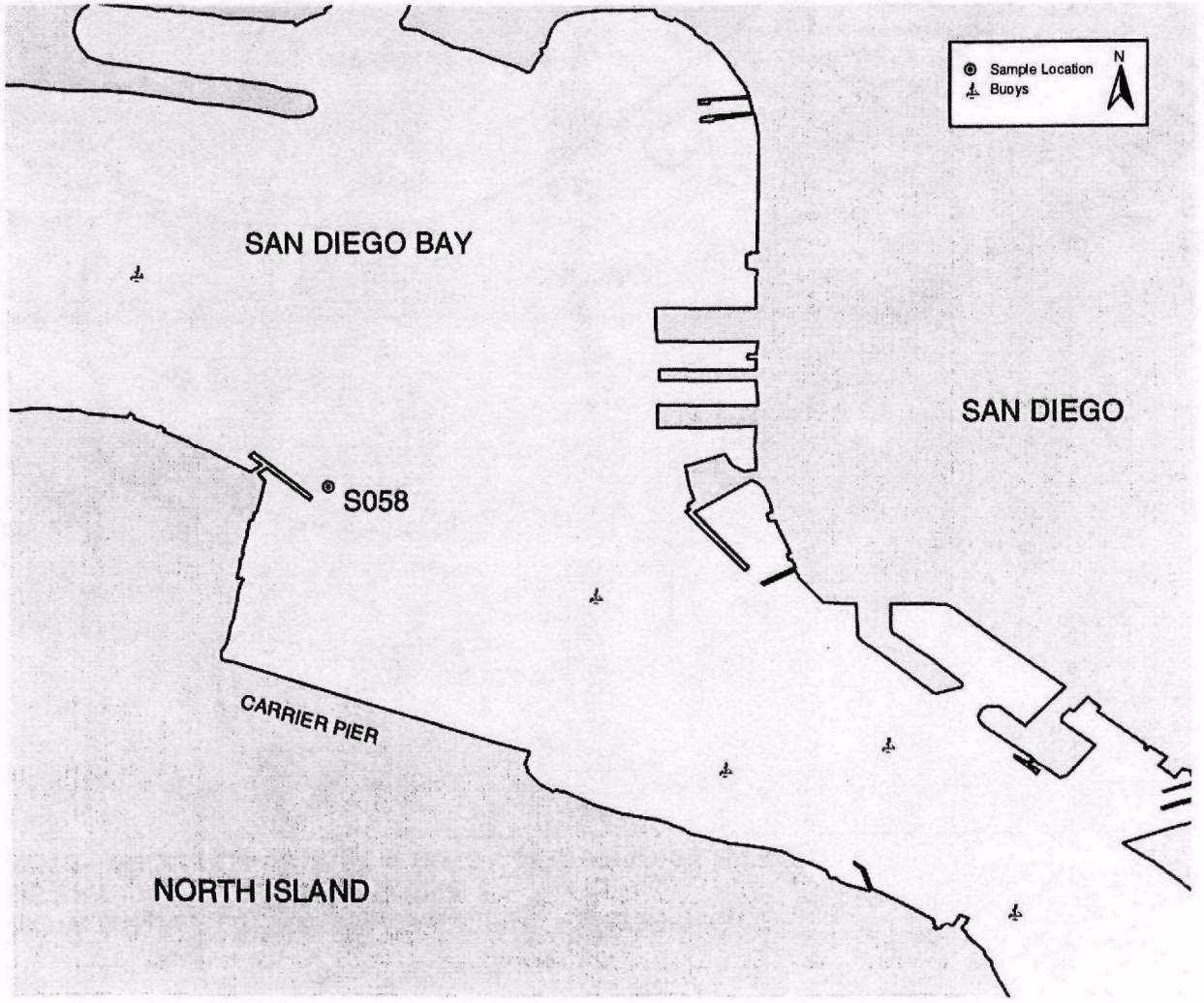


Fig. 7.0. BIOTA SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 7.1, 7.2
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

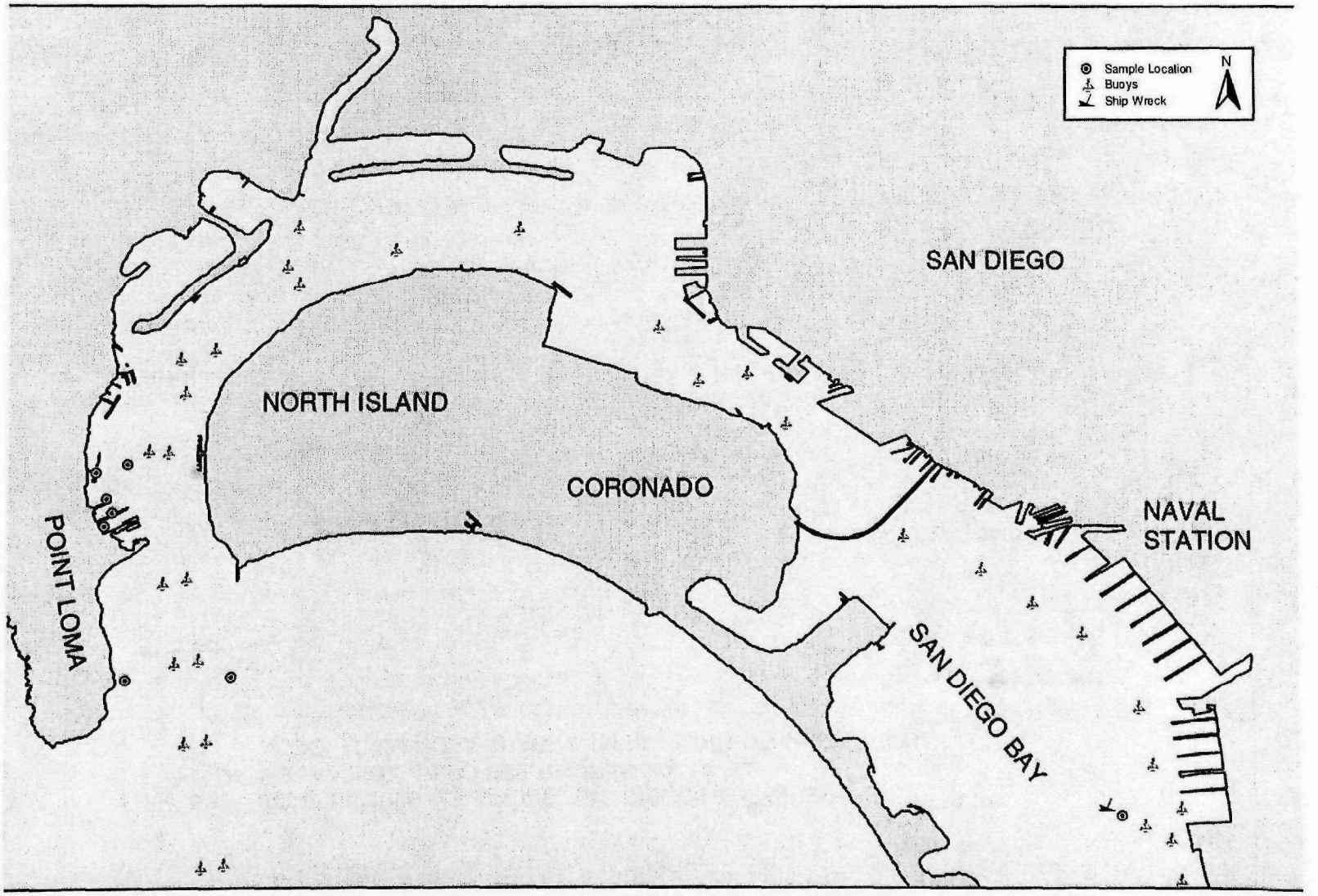


Fig. 7.1. BIOTA SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 7.0, 7.2
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

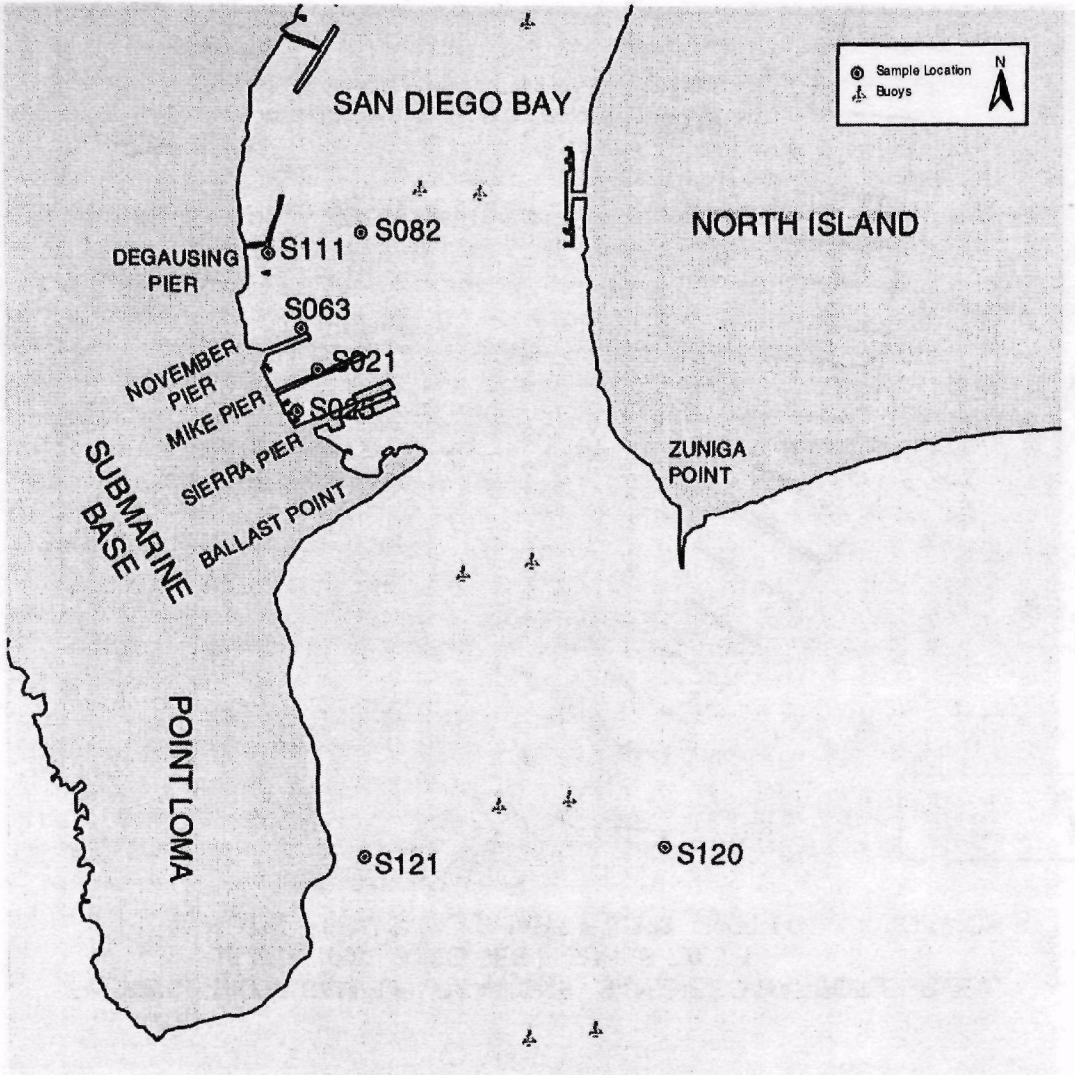


Fig. 7.2. BIOTA SAMPLE LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 7.0, 7.1
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

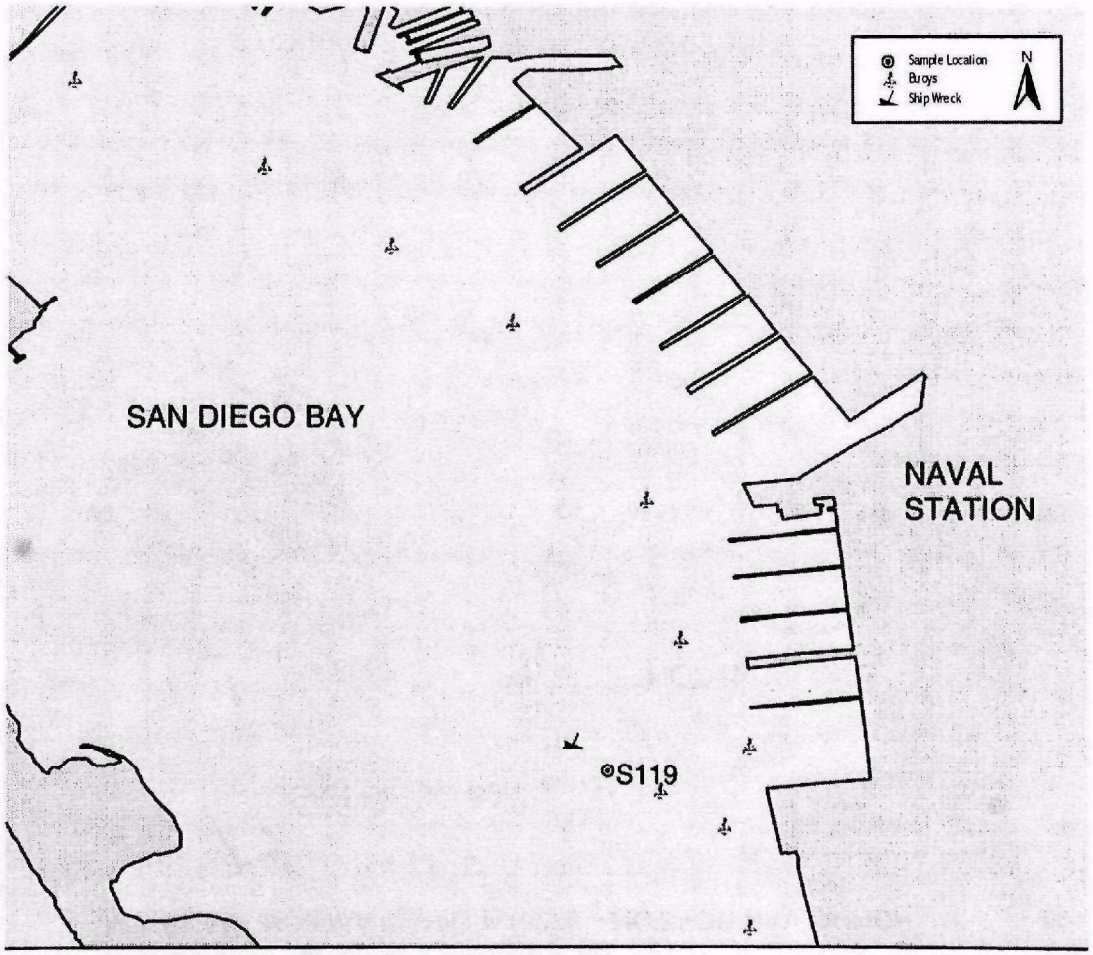


Fig. 8.0. EXTERNAL GAMMA MEASUREMENT LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 8.1, 8.2, 8.3, NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

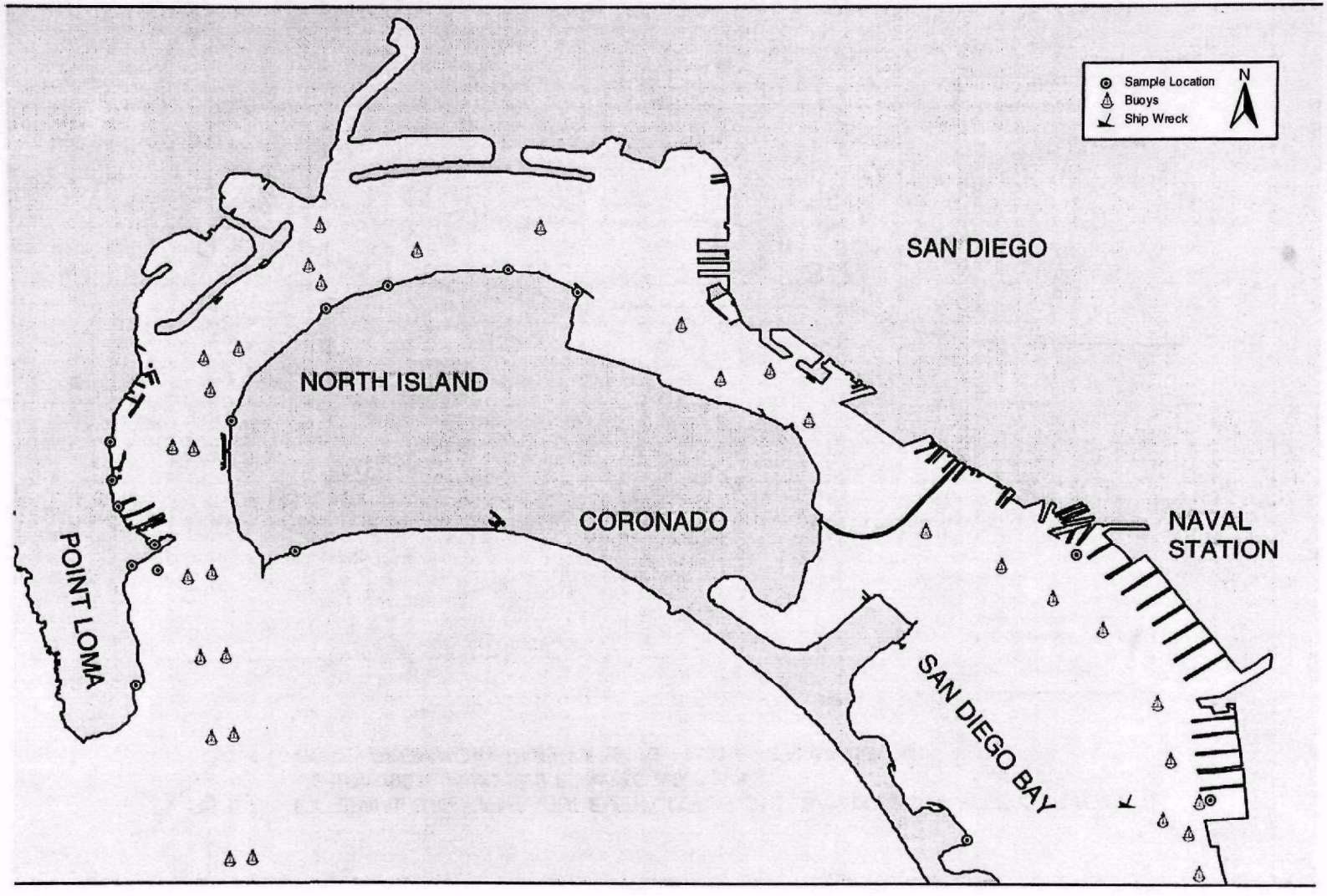


Fig. 8.1. EXTERNAL GAMMA MEASUREMENT LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 8.0, 8.2, 8.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

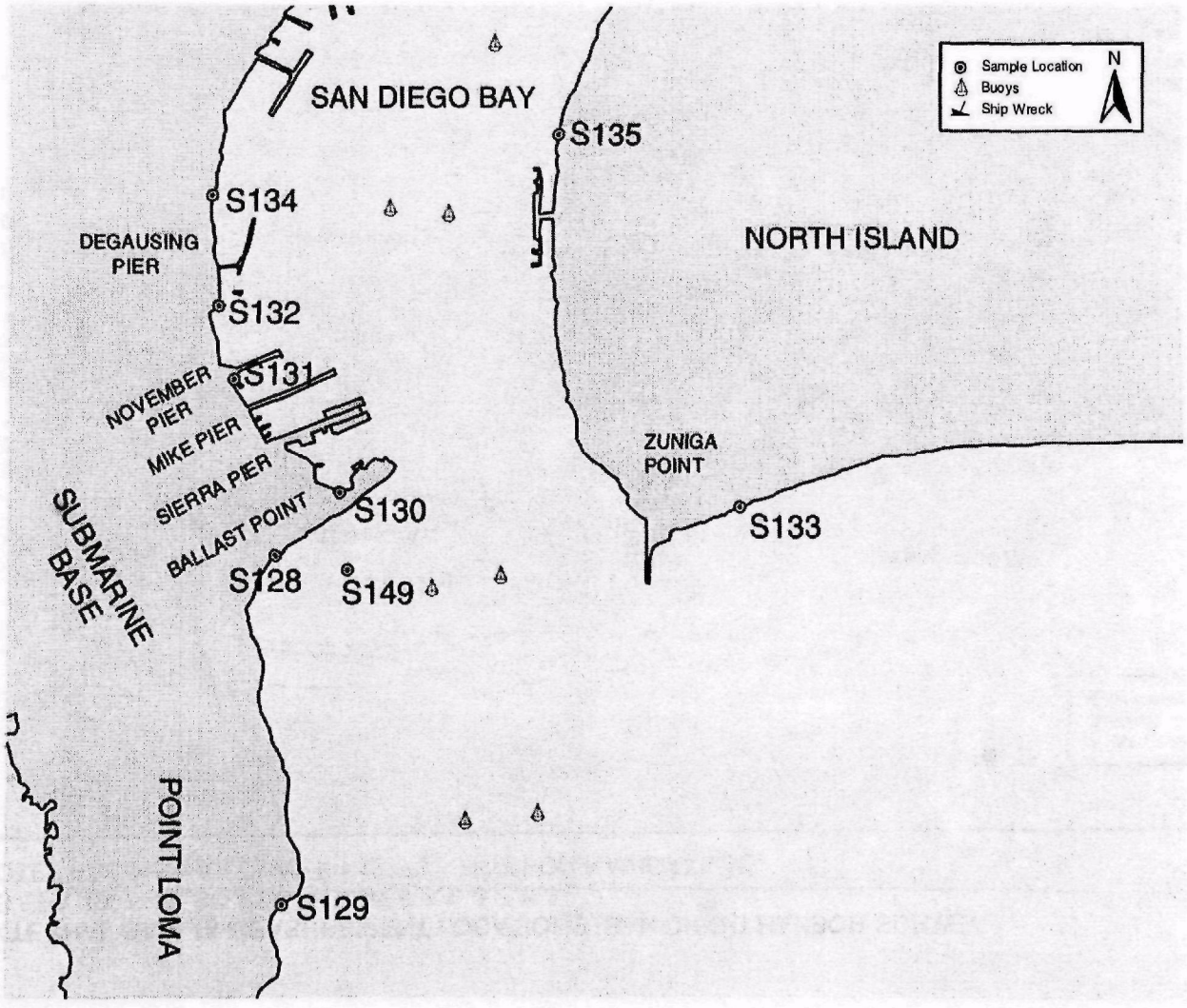


Fig. 8.2. EXTERNAL GAMMA MEASUREMENT LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 8.0, 8.1, 8.3
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.

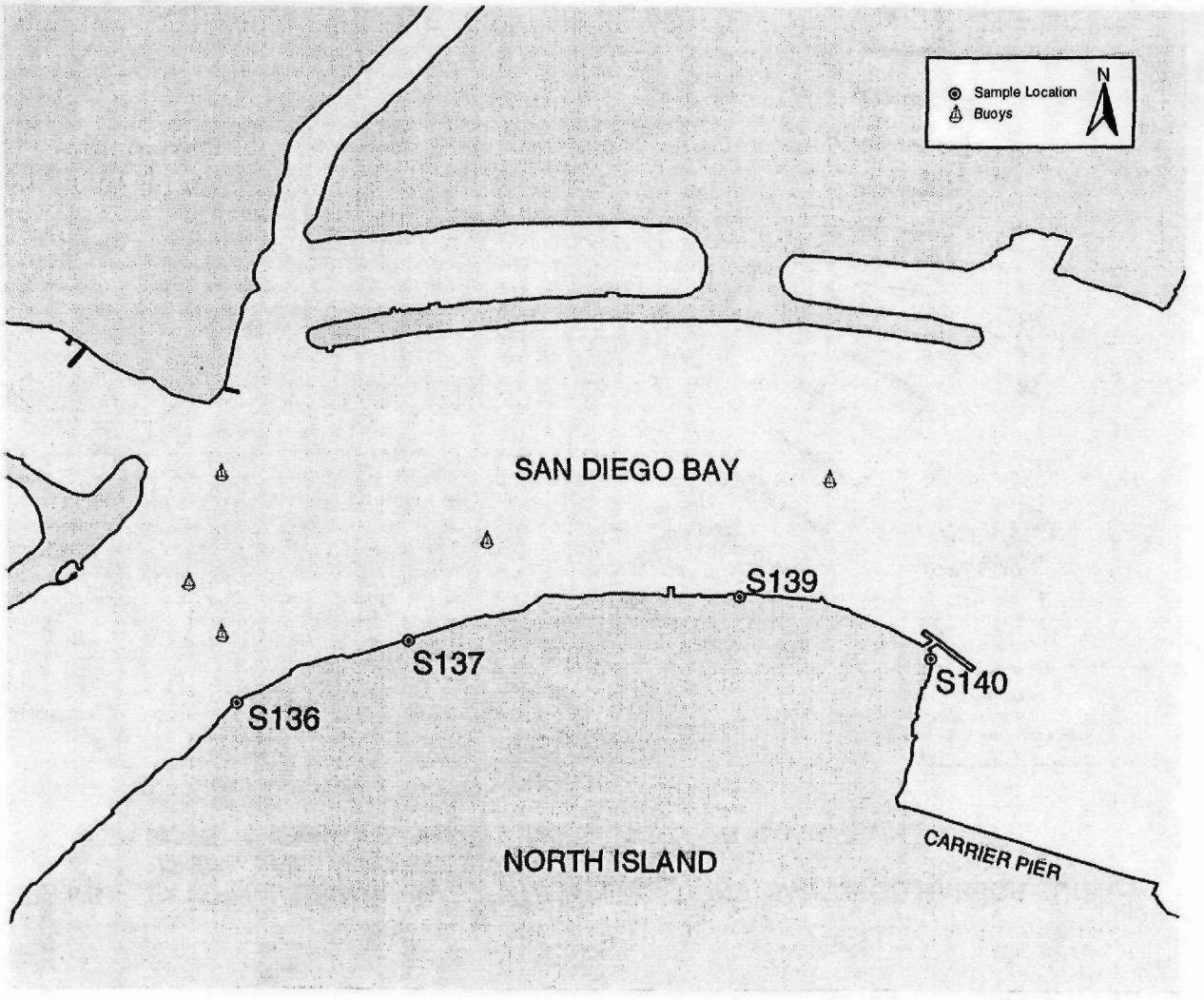
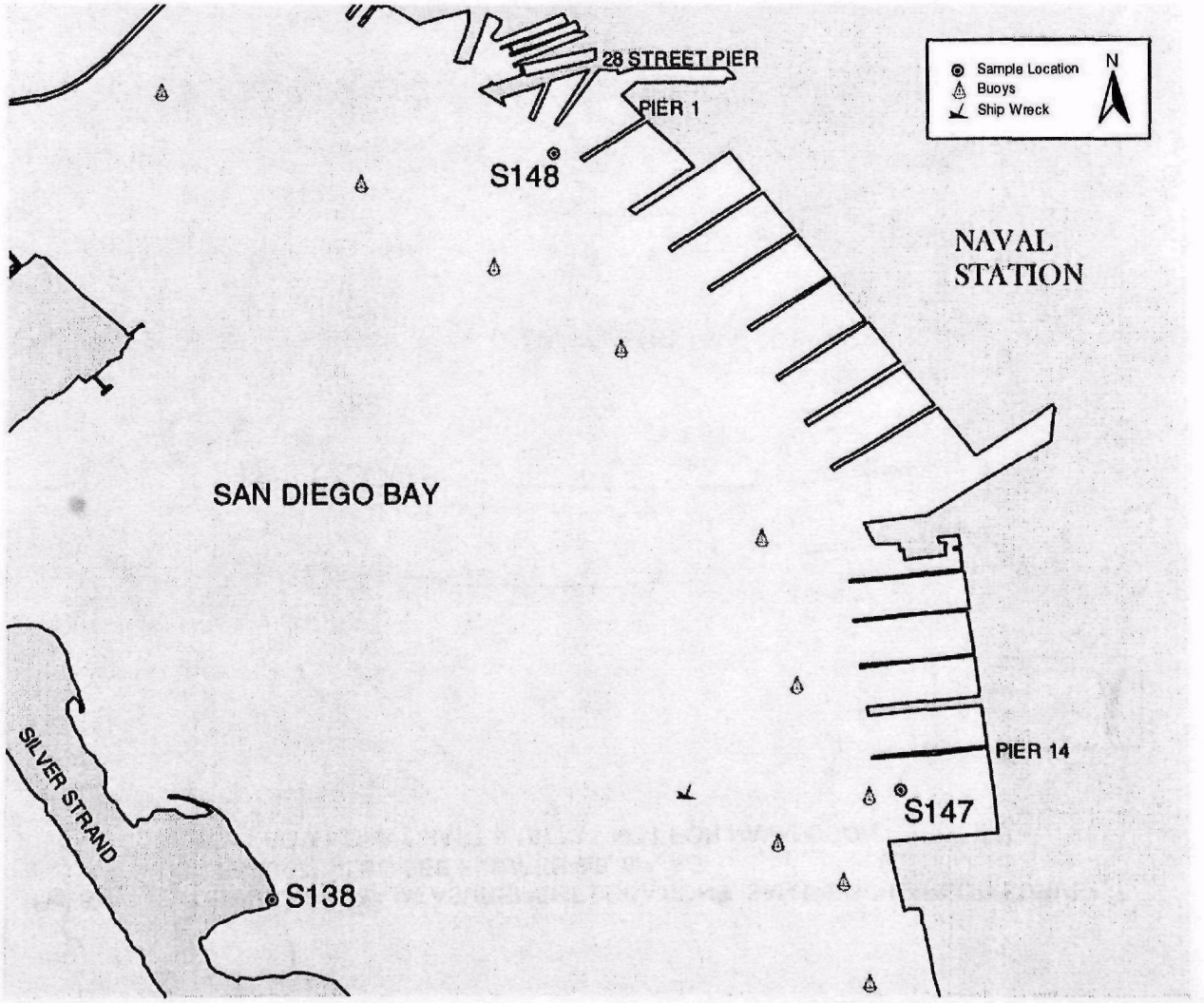


Fig. 8.3. EXTERNAL GAMMA MEASUREMENT LOCATIONS, SAN DIEGO HARBOR SURVEY, US EPA 1997. ALSO SEE FIGURES 8.0, 8.1, 8.2
NOTE: FROM NOAA CHART # 18773 - NOT FOR NAVIGATION.



3.0 RESULTS AND DISCUSSION

The radioanalytical results for the samples collected during this survey are reported in Appendix A. The tables were generated from the NAREL computer database of radioanalytical analysis results. The quality assurance/quality control (QA/QC) results for the laboratory analysis and field sample QA/QC were presented in the Data Quality Packages (EPA97c) for the sample analyses. The results were within acceptable limits as specified in the Quality Assurance Project Plan for this survey. Some of the reported radionuclide results are negative. Negative results occur when a previously determined background value is subtracted from a sample value that is less than that of the background value. Negative values represent a portion of the distribution of negative and positive values around zero for a sample containing very little or no radioactivity.

3.1 Water Samples

Seventeen surface water samples, including two duplicates and three backgrounds, were collected and the gamma analysis results are shown in Table A.1. Only naturally occurring radionuclides were detected in surface water samples collected from San Diego Harbor.

Tritium analyses were performed on all surface water samples, and the results for these analyses are presented in Table A.2. All of these concentrations were below the minimum detectable concentration (MDC) of about 160 pCi/L. Since the instrument background sample had a higher concentration of tritium than most of the study samples, large net negative values resulted for most of the study samples.

Results of the gross alpha and beta analyses of surface water samples are presented in Table A.3. Surface water samples had concentrations similar to the concentrations found in the background samples. The MDC values for gross alpha ranged from 350 to 600 pCi/L and the MDC values for the gross beta ranged from 190 to 390 pCi/L. These MDC values are higher than MDC values for freshwater samples due to the large amount of dissolved solids in the seawater.

Results of the Ra, U, Th, and Pu surface water samples are presented in Tables A.4, A.5, A.6, and A.7, respectively. Surface water samples had concentrations similar to the concentrations found in the background samples.

The gamma analysis results for the eight drinking water samples (including one duplicate and three backgrounds) that were collected are shown in Table A.8. Only naturally occurring radionuclides were detected in the drinking water samples collected from San Diego Harbor.

Tritium analyses were performed on all drinking water samples and results are presented in Table A.9. All of these concentrations were below the minimum detectable concentration of about 160 pCi/L.

Results of the gross alpha and beta analyses of drinking water samples are presented in Table A.10. The drinking water samples had maximum gross alpha and beta concentrations of 5.6 ± 3.7 pCi/L and 7.1 ± 1.9 pCi/L and background maximum gross alpha and beta concentrations of 10.5 ± 4.2 pCi/L and 8.0 ± 2.0 pCi/L. The National Drinking Water Regulations (EPA76), 40 CFR 141.15, states the maximum allowed gross alpha particle radioactivity in community water systems as 15 pCi/L, including radium-226 but excluding radon and uranium. The highest gross alpha concentration of 5.6 ± 3.7 pCi/L for the San Diego drinking water samples meets the drinking water regulation for the maximum allowed gross alpha activity for community water systems.

Drinking water samples in this study were not analyzed for Ra, U, Th, or Pu because none of these samples qualified among the highest gross alpha or gross beta. Background drinking water samples were analyzed for Ra, U, Th or Pu because all analyses were performed on all background water samples.

3.2 Sediment and Sediment Core Samples

Seventy-seven sediment samples were collected: 59 harbor bottom sediment samples, including 6 duplicates; 15 shoreline sediment samples, including 2 duplicates; and 3 background harbor sediment samples. The gamma-analysis results are shown in Tables A.11.a and A.11.b. No cobalt-60 was detected in any of the harbor or shoreline sediment samples collected at San Diego Harbor. The cobalt-60 MDC for sediment samples ranged from 0.012 to 0.035 pCi/g-dry due to varying detector efficiencies, varying background counts, and sample size. All samples were counted on HPGe detectors for 1000 minutes. The gamma-emitting radionuclides measured in the sediment samples were naturally occurring radionuclides and fallout from atmospheric nuclear tests and the Chernobyl reactor accident in 1986. No tritium analysis was performed on harbor and shoreline sediment samples.

Results of the gross alpha and beta analyses of harbor and shoreline sediment samples are presented in Table A.12. The maximum gross alpha and beta concentrations in the study samples were 22.8 ± 8.8 pCi/g-dry and 25.8 ± 4.4 pCi/g-dry and 8.0 ± 5.6 pCi/g-dry and 19.5 ± 3.6 pCi/g-dry in background samples. The harbor and shoreline sediment samples had concentrations similar to the concentrations found in the background samples.

Results of the Ra, U, Th, and Pu analyses of harbor sediment samples are presented in Tables A.13, A.14, A.15, and A.16. Harbor sediment samples had concentrations similar to the concentrations found in the background samples. Shoreline sediment samples were not analyzed for Ra, U, Th, or Pu because none of these samples qualified among the highest gross alpha or gross beta.

Sediment core samples were taken at 15 sites including 2 duplicate and 3 background sites. Gamma analysis results for sediment core samples are shown in Tables A.17.a-d. Cobalt-60 was identified in one core sediment sample at the Naval Submarine Base at location S025 in the segment depth between 20 cm and 35.5 cm. The concentration of cobalt-60 was 0.022 ± 0.012 pCi/g-dry weight. This concentration is very small compared to the cobalt-60 concentrations measured in sediment samples from the Submarine Base in the 1967 survey (Ca67) and slightly lower than the sediment sample concentrations measured in the 1986 survey (Se89). During the 1967 survey, concentrations in sediment ranged from about 17 pCi/g-dry at the Sub Pier to 0.2 pCi/g-dry off the tip of Ballast Point. During the 1986 survey, concentrations in sediment ranged from about 0.015 to 0.047 pCi/g-dry at the Sub Base and .030 pCi/g-dry at North Island. The decay of the cobalt-60 present in 1986 would yield an expected concentration during this survey of about .003 to .011 pCi/g-dry. The cobalt-60 measured in this survey is consistent with concentrations expected from radioactive decay of the cobalt-60 levels found in the prior surveys. No cobalt-60 was detected in any of the other sediment core samples collected at San Diego Harbor. All of the other radionuclides identified in the core sediment samples can be attributed to naturally occurring radionuclides, fallout from nuclear weapons testing, or the Chernobyl reactor accident in 1986. The radionuclide content of the core samples showed no significant differences with depth or with the dredge samples taken in the same general area. Underwater gamma scintillation probe measurements were also made at each core sampling site and no radioactivity above background was detected. The probe had a much lower sensitivity than the laboratory analysis of sediment samples and was only used as a gross screening technique. If radioactivity above background had been detected with the underwater probe, additional sediment samples would have been taken in the area to quantify the levels of radionuclides in the harbor. No tritium analysis was performed on sediment core samples.

Results of the gross alpha and beta analyses of sediment core samples are shown in Tables A.18.a and A.18.b. Gross alpha and beta concentrations in sediment core samples at San Diego Harbor are similar to, but slightly elevated above concentrations found in sediment core samples at the background locations.

Results of the Ra, U, Th, and Pu analyses of sediment core samples are presented in Tables A.19, A.20, A.21, and A.22, respectively. Sediment core samples had concentrations similar to the concentrations found in the background samples.

3.3 Biota Samples

Fifteen biota samples were collected, including two duplicate and five background samples, and the gamma analyses results are shown in Tables A.23.a and A.23.b. All of the radionuclides identified in the biota samples were attributed to naturally occurring radionuclides or fallout from nuclear weapons testing and the Chernobyl reactor accident in 1986. No tritium analysis was performed on biota samples.

Results of the gross alpha and beta analyses of biota samples are presented in Table A.24. Biota samples collected from San Diego Harbor had concentrations similar to the concentrations found in the background samples.

Results of the Ra, U, Th, and Pu analyses of biota samples are presented in Tables A.25, A.26, A.27 and A.28. Biota samples had concentrations similar to the concentrations found in the background samples.

3.4 External Radiation Measurements

External radiation measurements were made along the shoreline and in the harbor with emphasis on areas accessible to the public. Measurements were recorded every 10 minutes during the survey with a GENITRON Instruments GammaTRACER GM-based survey instrument and readings were downloaded at each external monitoring location. External exposure readings were also taken for 5 to 10 minutes at each location with a Reuter Stokes model RSS-112 pressurized ion chamber (PIC). An Eberline E-600 instrument with a SPA-6 2"x 2" NaI(Tl) probe was also used to measure variations in exposure rates along the shoreline in the area of the monitoring locations. Results of the external radiation measurements are shown in Table A.29 for San Diego Harbor locations and background locations. External exposure readings at San Diego Harbor were similar to those at background locations.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

4.1 The Quality Assurance Program

The NAREL Quality Assurance (QA) Plan applies to all work performed at NAREL. The purpose of the quality assurance program is to ensure that all measurements performed at NAREL are valid, scientifically defensible, and of known precision and accuracy. The NAREL Quality Assurance Project Plan (QAPP) for the U.S. Navy Environmental Studies (EPA 97b) was prepared in accordance with the requirements described in "EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations" (EPA94).

Quality Assurance/Quality Control (QA/QC) for the laboratory analyses performed for this survey is detailed in the QAPP (EPA97b). Quality control (QC) samples are analyzed in conjunction with routine samples to ensure the quality of the analytical results. Corrective actions must be taken when it is shown by the results of QC samples that the radioanalytical procedure is beyond predetermined control limits. Quality assurance is equally important in the sample collection process. All documentation including chain-of-custody forms were properly completed. Sampling equipment was in good working order and field measurement equipment was calibrated and properly maintained.

4.2 Quality Control Samples

Field and laboratory quality control samples were included with site samples to help evaluate the entire sampling and analysis process. Evaluation of QC samples allows assessment of the accuracy and precision of the analytical procedures. In the field, for each matrix and batch of up to 20 samples, a field duplicate was collected. The field duplicate results assess the consistency of the sampling process and the representativeness of the samples collected.

In the laboratory, samples were grouped in batches for quality control purposes, with a maximum of 20 samples per matrix per analysis type. For each batch, the laboratory analyzed a reagent blank, a matrix spike, a matrix spike duplicate, and a laboratory replicate sample. However, for gamma spectrometry and gross alpha and beta analyses, only a recount (duplicate) or split was performed for batch QC. Results of these QC samples were reviewed with sample results as part of the data verification and review process. Specific criteria for acceptance were included in the QAPP (EPA97b). All blank results were maintained on control charts by analyst, matrix, and analyte. Warning and rejection limits were used to assess acceptance of the blank results. No substantial corrective actions were required during the processing and analysis of the samples for this survey. Radioanalytical sample results complied with the terms and conditions of the QAPP as certified by the NAREL Quality Assurance Coordinator and Chief, Monitoring and Analytical Services Branch.

4.3 Performance Evaluation Programs

It is NAREL policy to participate in many intralaboratory comparisons of radioactivity measurements and cross-check programs. NAREL participates in intercomparison QA studies with the EPA Office of Research and Development Environmental Science Division (ORD-ESD) in Las Vegas; the National Institute of Science and Technology (NIST) in Gaithersburg, MD; the World Health Organization (WHO) in Le Vesinet, France; the International Atomic Energy Agency (IAEA), Vienna, Austria; and Analytics, a commercial company in Atlanta, Georgia. The most comprehensive of these QA studies is that with EPA's ORD-ESD Laboratory in Las Vegas, which supplies NAREL with thirty cross-check samples a year in water, milk, and food.

5.0 CONCLUSIONS

The radiological survey at the San Diego Harbor provides the basis for the following conclusions:

1. Water samples from the San Diego Harbor contained radioactivity at concentrations typically found naturally. No man-made radionuclides were detected.

2. No radioactivity was detected in the harbor and shoreline sediment samples other than naturally occurring radionuclides or fallout from atmospheric nuclear tests and the Chernobyl reactor accident in 1986.

3. A trace amount of cobalt-60 (0.022 ± 0.012 pCi/g-dry) was detected in the bottom segment of one sediment core sample at the Naval Submarine Base at location S025 between Mike Pier and Sierra Pier. No other radioactivity was detected in the sediment core samples other than naturally occurring radionuclides or fallout from atmospheric nuclear tests and the Chernobyl reactor accident in 1986.

4. No radioactivity was detected in the biota samples other than naturally occurring radionuclides.

5. External radiation measurements did not detect any increased radiation levels above natural background.

6. Based on this radiological survey, practices regarding nuclear-powered warship operations at San Diego Harbor have resulted in no increases in radioactivity causing significant population exposure or contamination of the environment.

6.0 REFERENCES

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EPA76 U.S. Environmental Protection Agency. *National Interim Primary Drinking Water Regulations*. EPA-570/9-76-003. Office of Water Supply. (See also *Federal Register*, Vol. 41, No.133, "National Interim Primary Drinking Water Regulations, Final Rule," pp. 28402-28409, 41 FR 28402, July 9, 1976.)

EPA97a U.S. Environmental Protection Agency. "Work Plan for Environmental Study at the Naval Station, Naval Submarine Base and Naval Air Station/North Island San Diego." Montgomery, Ala.: National Air and Radiation Environmental Laboratory, March 8, 1997.

EPA97b U.S. Environmental Protection Agency. "Quality Assurance Project Plan for U.S. Navy Environmental Studies." Montgomery, Ala.: National Air and Radiation Environmental Laboratory, March 8, 1997.

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Se89 Semler, M..O., and Blanchard, R.L. *Radiological Survey of San Diego Bay*. EPA 520/5-88-019. Montgomery, Ala.: National Air and Radiation Environmental Laboratory, March 1989.

APPENDIX

Radioanalytical Results

for

San Diego Harbor Samples

March 1997

TABLE A.1
Gamma Spectrometry Results for Surface Water Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)									
NAREL Sample ID	Field Sample Number	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{224}Ra	^{212}Pb	^{208}Tl	^{60}Co	^{60}Co MDA	^{40}K
SDH 97.01939	S063-W	ND	ND	ND	ND	ND	ND	ND	ND	6.8	333 ± 53
SDH 97.01940	S027-W	ND	ND	ND	ND	ND	ND	ND	ND	5.9	296 ± 47
SDH 97.01941	S025-W	ND	ND	ND	ND	ND	ND	ND	ND	6.9	330 ± 52
SDH 97.01938	S025-W-DUP	ND	ND	ND	ND	ND	ND	ND	ND	10.8	319 ± 84
SDH 97.02092	S076-W	ND	ND	ND	ND	ND	ND	3.0 ± 3.6	ND	6.1	320 ± 53
SDH 97.02093	S048-W	ND	ND	ND	ND	ND	ND	ND	ND	11.4	330 ± 85
SDH 97.02094	S054-W	ND	ND	ND	ND	ND	ND	ND	ND	5.4	313 ± 48
SDH 97.02096	S058-W	ND	ND	ND	ND	ND	ND	ND	ND	6.2	300 ± 53
SDH 97.02100	S-115-W	ND	ND	ND	5.5 ± 7.6	32 ± 49	3.8 ± 5.1	ND	ND	6.2	301 ± 52
SDH 97.02101	S-081-W	ND	ND	ND	ND	ND	ND	ND	ND	5.0	296 ± 44
SDH 97.02108	S021-W	ND	ND	6.2 ± 6.8	ND	ND	9.5 ± 7.0	ND	ND	6.7	311 ± 52
SDH 97.02107	S021-W-DUP	ND	ND	ND	ND	ND	ND	ND	ND	5.7	310 ± 48
SDH 97.02110	S111-W	348 ± 298	ND	ND	ND	ND	ND	ND	ND	5.4	347 ± 48
SDH 97.02111	S082-W	ND	ND	ND	ND	ND	ND	ND	ND	9.5	318 ± 71
BACKGROUND SAMPLES											
SDH 97.02095	S119-W-BG	ND	52.0 ± 68.3	ND	ND	ND	ND	ND	ND	5.7	307 ± 45
SDH 97.02102	S121-W-BG	ND	ND	ND	ND	ND	ND	ND	ND	6.0	329 ± 50
SDH 97.02109	S120-W-BG	ND	ND	ND	ND	ND	ND	ND	ND	9.8	337 ± 81

ND = Radionuclide was not detected by gamma spectrometry.

TABLE A.2
Tritium Results for Surface Water Samples taken in San Diego Harbor

STUDY SAMPLES		Tritium Activity (pCi/L ± 2σ counting error)
NAREL Sample ID	Field Sample Number	Tritium
97.01939P	S-063-W	29 ± 84
97.01940G	S-027-W	-63 ± 80
97.01941H	S-025-W	-92 ± 79
97.01938N	S-025-W-DUP	-51 ± 80
97.02092V	S-076-W	-17 ± 82
97.02093W	S-048-W	-46 ± 81
97.02094X	S-054-W	-19 ± 82
97.02096Z	S-058-W	-48 ± 81
97.02100B	S-115-W	-17 ± 82
97.02101C	S-081-W	-42 ± 93
97.02108K	S-021-W	-52 ± 92
97.02107J	S-021-W-DUP	-75 ± 91
97.02110D	S-111-W	-30 ± 93
97.02111E	S-082-W	-65 ± 91
BACKGROUND SAMPLES		
97.02095Y	S-119-W-BG	-48 ± 80
97.02102D	S-121-W-BG	-60 ± 94
97.02109L	S-120-W-BG	-59 ± 94

TABLE A.3
Gross Alpha and Gross Beta Results for Surface Water Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.01939	S-063-W	72 ± 194	506 ± 153
SDH 97.01940	S-027-W	59 ± 192	502 ± 152
SDH 97.01941	S-025-W	119 ± 263	532 ± 184
SDH 97.01938	S-025-W-DUP	-44 ± 154	501 ± 151
SDH 97.02092	S-076-W	-165 ± 234	516 ± 182
SDH 97.02093	S-048-W	-105 ± 156	514 ± 175
SDH 97.02094	S-054-W	-41 ± 181	580 ± 183
SDH 97.02096	S-058-W	42 ± 205	552 ± 252
SDH 97.02100	S-115-W	14 ± 212	381 ± 232
SDH 97.02101	S-081-W	194 ± 270	661 ± 257
SDH 97.02108	S-021-W	164 ± 286	470 ± 251
SDH 97.02107	S-021-W-DUP	-28 ± 215	491 ± 262
SDH 97.02110	S-111-W	-117 ± 123	473 ± 251
SDH 97.02111	S-082-W	-21 ± 222	429 ± 250
BACKGROUND SAMPLES			
SDH 97.02095	S-119-W-BG	0 ± 168	494 ± 188
SDH 97.02102	S-121-W-BG	51 ± 257	332 ± 232
SDH 97.02109	S-120-W-BG	59 ± 227	728 ± 260

TABLE A.4
Radium-226 Results for Drinking and Surface Water Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)
NAREL Sample ID	Field Sample Number	^{226}Ra
97.02094X	S-054-W	0.123 ± 0.014
97.02101C	S-081-W	0.120 ± 0.014
97.02110D	S-111-W	0.101 ± 0.014
97.01941H	S-025-W	0.099 ± 0.014
BACKGROUND SAMPLES		
97.02095Y	S-119-W-BG	0.130 ± 0.015
97.02102D	S-121-W-BG	0.108 ± 0.013
97.02109L	S120-W-BG	0.108 ± 0.014
97.02113G	S143-D-BG	0.138 ± 0.014
97.02114H	S142-D-BG	0.147 ± 0.015
97.02115J	S146-D-BG	0.199 ± 0.039

Note: Drinking water and surface water samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for radium-226 content. None of the study drinking water samples contained the highest gross alpha or gross beta concentrations. Therefore, uranium analysis was not conducted for study drinking water samples. All background samples were analyzed for radium-226.

TABLE A.5
Uranium Results for Drinking and Surface Water Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)		
NAREL Sample ID	Field Sample Number	^{234}U	^{235}U	^{238}U
SDH 97.02094	S-054-W	1.81 ± 0.36	0.11 ± 0.10	1.15 ± 0.28
SDH 97.02101	S-081-W	1.54 ± 0.33	0.15 ± 0.11	1.44 ± 0.32
SDH 97.02110	S-111-W	1.35 ± 0.21	0.11 ± 0.06	1.17 ± 0.19
SDH 97.01941	S-025-W	5.80 ± 1.34	0.37 ± 0.36	3.00 ± 0.94
BACKGROUND SAMPLES				
SDH 97.02095	S-119-W-BG	2.87 ± 0.56	0.12 ± 0.16	1.84 ± 0.45
SDH 97.02102	S-121-W-BG	1.68 ± 0.35	0.08 ± 0.08	1.10 ± 0.27
SDH 97.02109	S-120-W-BG	1.68 ± 0.35	0.20 ± 0.13	1.18 ± 0.29
SDH 97.02113	S-143-D-BG	3.04 ± 0.45	0.23 ± 0.12	1.92 ± 0.34
SDH 97.02114	S-142-D-BG	2.67 ± 0.39	0.19 ± 0.10	1.71 ± 0.30
SDH 97.02115	S-146-D-BG	3.07 ± 0.66	0.19 ± 0.18	1.70 ± 0.48

Note: Drinking water and surface water samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for uranium content. None of the study drinking water samples contained the highest gross alpha or gross beta concentrations. Therefore, uranium analysis was not conducted for study drinking water samples. All background samples were analyzed for uranium.

TABLE A.6
Thorium Results for Drinking and Surface Water Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)			
NAREL Sample ID	Field Sample Number	^{227}Th	^{228}Th	^{230}Th	^{232}Th
SDH 97.02094	S-054-W	-0.009 ± 0.035	-0.091 ± 0.070	0.019 ± 0.034	0.043 ± 0.051
SDH 97.02101	S-081-W	0.171 ± 0.654	0.442 ± 1.038	0.357 ± 0.357	0.208 ± 0.320
SDH 97.02110	S-111-W	0.013 ± 0.040	-0.139 ± 0.053	0.027 ± 0.042	0.023 ± 0.036
SDH 97.01941	S-025-W	0.050 ± 0.236	0.297 ± 0.445	0.382 ± 0.258	0.025 ± 0.080
BACKGROUND SAMPLES					
SDH 97.02095	S-119-W-BG	0.007 ± 0.049	-0.161 ± 0.113	0.097 ± 0.068	0.041 ± 0.045
SDH 97.02102	S-121-W-BG	0.022 ± 0.069	-0.257 ± 0.139	0.142 ± 0.111	0.006 ± 0.038
SDH 97.02109	S-120-W-BG	0.092 ± 0.204	-0.301 ± 0.208	0.173 ± 0.156	0.105 ± 0.117
SDH 97.02113	S-143-D-BG	0.038 ± 0.051	-0.040 ± 0.068	0.077 ± 0.050	0.015 ± 0.021
SDH 97.02114	S-142-D-BG	0.000 ± 0.035	0.059 ± 0.090	0.059 ± 0.046	0.000 ± 0.019
SDH 97.02115	S-146-D-BG	-0.012 ± 0.121	0.054 ± 0.249	0.177 ± 0.129	0.000 ± 0.044

Note: Drinking water and surface water samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for thorium content. None of the study drinking water samples contained the highest gross alpha or gross beta concentrations. Therefore, thorium analysis was not conducted for study drinking water samples. All background samples were analyzed for thorium.

TABLE A.7
Plutonium Results for Drinking and Surface Water Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	^{238}Pu	$^{239/240}Pu$
SDH 97.02094	S-054-W	0.029 ± 0.063	0.000 ± 0.034
SDH 97.02101	S-081-W	0.057 ± 0.618	0.057 ± 0.180
SDH 97.02110	S-111-W	0.026 ± 0.085	0.019 ± 0.059
SDH 97.01941	S-025-W	0.049 ± 0.138	0.073 ± 0.104
BACKGROUND SAMPLES			
SDH 97.02095	S-119-W-BG	0.076 ± 0.174	0.000 ± 0.048
SDH 97.02102	S-121-W-BG	0.006 ± 0.075	0.006 ± 0.042
SDH 97.02109	S-120-W-BG	0.000 ± 0.176	0.000 ± 0.000
SDH 97.02113	S143-D-BG	0.010 ± 0.030	-0.008 ± 0.009
SDH 97.02114	S142-D-BG	0.021 ± 0.030	-0.002 ± 0.004
SDH 97.02115	S146-D-BG	0.071 ± 0.084	0.011 ± 0.035

Note: Drinking water and surface water samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for plutonium content. None of the study drinking water samples contained the highest gross alpha or gross beta concentrations. Therefore, plutonium analysis was not conducted for study drinking water samples. All background samples were analyzed for plutonium.

TABLE A.8
Gamma Spectrometry Results for Drinking Water Samples taken in the vicinity of San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)						
NAREL Sample ID	Field Sample Number	^{226}Ra	^{214}Bi	^{212}Pb	^{208}Tl	^{60}Co	^{60}Co MDA	^{40}K
SDH 97.01937	S-145-D	ND	ND	ND	ND	ND	6.1	24 ± 35
SDH 97.02104	S-144-D	ND	ND	ND	ND	ND	5.3	ND
SDH 97.02105	S-144-D-DUP	ND	ND	6.6 ± 5.4	ND	ND	6.3	ND
SDH 97.02115	S-146-D	ND	ND	ND	ND	ND	4.5	ND
BACKGROUND SAMPLES								
SDH 97.02098	S-141-D-BG	ND	ND	ND	ND	ND	6.1	ND
SDH 97.02099	S-142-D-BG	ND	ND	ND	ND	ND	6.3	ND
SDH 97.02113	S143-D-BG	66 ± 73	10.1 ± 6.3	ND	ND	ND	5.4	ND
SDH 97.02114	S-150-D-BG	ND	ND	ND	1.9 ± 3.2	ND	5.5	ND

ND = Radionuclide was not detected by gamma spectrometry.

The drinking water background for Point Loma was collected twice. The KFC (Kentucky Fried Chicken restaurant) sample results are denoted in the results tables as S-142-D-BG although it is also a background location. The second sample was taken at the Point Loma Inn, and the sample results are denoted in the results tables as S-150-D-BG.

TABLE A.9
Tritium Results for Drinking Water Samples taken in San Diego Harbor

STUDY SAMPLES		Tritium Activity (pCi/L ± 2σ counting error)
NAREL Sample ID	Field Sample Number	Tritium
97.01937M	S-145-D	-41 ± 84
97.02104F	S-144-D	-48 ± 92
97.02105G	S-144-D-DUP	-56 ± 92
97.02115J	S-146-D	44 ± 96
BACKGROUND SAMPLES		
97.02098B	S-141-D-BG	-31 ± 82
97.02099C	S-142-D-BG	-34 ± 83
97.02113G	S-143-D-BG	22 ± 95
97.02114H	S-150-D-BG	56 ± 97

The drinking water background for Point Loma was collected twice. The KFC (Kentucky Fried Chicken restaurant) sample results are denoted in the results tables as S-142-D-BG although it is also a background location. The second sample was taken at the Point Loma Inn, and the sample results are denoted in the results tables as S-150-D-BG.

TABLE A.10
Gross Alpha and Gross Beta Results for Drinking Water Samples taken in the vicinity of San Diego Harbor

STUDY SAMPLES		Activity (pCi / L ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.01937	S-145-D	5.6 ± 3.7	3.9 ± 1.8
SDH 97.02104	S-144-D	5.0 ± 3.0	5.7 ± 1.9
SDH 97.02105	S-144-D-DUP	4.3 ± 2.6	7.1 ± 1.9
BACKGROUND SAMPLES			
SDH 97.02115	S-146-D-BG	2.2 ± 3.2	7.9 ± 2.1
SDH 97.02098	S-141-D-BG	10.5 ± 4.2	8.0 ± 2.0
SDH 97.02099	S-142-D-BG	3.5 ± 2.7	6.5 ± 2.0
SDH 97.02113	S-143-D-BG	2.8 ± 2.5	6.4 ± 2.0
SDH 97.02114	S-150-D-BG	2.1 ± 2.2	5.4 ± 1.9

The drinking water background for Point Loma was collected twice. The KFC (Kentucky Fried Chicken restaurant) sample results are denoted in the results tables as S-142-D-BG although it is also a background location. The second sample was taken at the Point Loma Inn, and the sample results are denoted in the results tables as S-150-D-BG.

TABLE A.11.a
Gamma Spectrometry Results for Harbor and Shoreline Sediment Samples taken in San Diego Harbor
Uranium and Actinium Chain Gamma Emitting Radionuclides

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
STUDY SAMPLES - HARBOR SEDIMENT								
SDH 97.01918	S-107-S	ND	1.29 ± 1.27	1.05 ± 0.22	0.413 ± 0.021	0.400 ± 0.023	ND	ND
SDH 97.01919	S-108-S	0.29 ± 0.14	1.48 ± 1.17	0.89 ± 0.19	0.317 ± 0.020	0.308 ± 0.022	ND	ND
SDH 97.01924	S-108-S-DUP	0.34 ± 0.15	0.99 ± 1.03	0.87 ± 0.21	0.311 ± 0.020	0.305 ± 0.022	ND	ND
SDH 97.01920	S-113-S	0.54 ± 0.16	1.25 ± 1.04	1.09 ± 0.20	0.432 ± 0.020	0.393 ± 0.024	ND	ND
SDH 97.01923	S-020-S	0.25 ± 0.13	1.44 ± 1.21	1.01 ± 0.22	0.404 ± 0.021	0.378 ± 0.022	ND	ND
SDH 97.01925	S-105-S	0.72 ± 0.14	1.32 ± 1.00	0.87 ± 0.17	0.351 ± 0.019	0.338 ± 0.021	0.053 ± 0.010	ND
SDH 97.01926	S-109-S	0.91 ± 0.15	1.22 ± 1.20	1.12 ± 0.21	0.483 ± 0.021	0.442 ± 0.022	ND	ND
SDH 97.01927	S-112-S	ND	ND	0.78 ± 0.21	0.350 ± 0.020	0.318 ± 0.022	ND	ND
SDH 97.01933	S-027-S	0.34 ± 0.14	1.69 ± 0.82	1.09 ± 0.20	0.511 ± 0.020	0.474 ± 0.020	ND	ND
SDH 97.01934	S-063-S	0.41 ± 0.14	ND	1.33 ± 0.22	0.520 ± 0.020	0.481 ± 0.021	0.080 ± 0.013	ND
SDH 97.01942	S-025-S	0.50 ± 0.16	ND	1.25 ± 0.23	0.493 ± 0.023	0.467 ± 0.026	0.077 ± 0.014	ND
SDH 97.01935	S-025-S-DUP	0.81 ± 0.14	1.53 ± 0.99	0.95 ± 0.20	0.405 ± 0.019	0.397 ± 0.019	ND	ND
SDH 97.01943	S-084-S	0.68 ± 0.15	ND	0.63 ± 0.20	0.302 ± 0.020	0.277 ± 0.022	ND	ND
SDH 97.01944	S-023-S	0.85 ± 0.13	1.77 ± 1.01	0.91 ± 0.18	0.389 ± 0.017	0.353 ± 0.018	ND	ND
SDH 97.01945	S-122-S	ND	0.99 ± 1.00	0.63 ± 0.20	0.286 ± 0.019	0.247 ± 0.020	ND	ND
SDH 97.01946	S-019-S	0.79 ± 0.16	0.73 ± 0.89	0.64 ± 0.18	0.317 ± 0.016	0.298 ± 0.016	ND	ND
SDH 97.01947	S-106-S	1.22 ± 0.17	ND	0.72 ± 0.21	0.302 ± 0.020	0.281 ± 0.022	ND	ND
SDH 97.02040	S-048-S	0.41 ± 0.12	1.06 ± 0.88	1.10 ± 0.19	0.394 ± 0.018	0.376 ± 0.018	ND	ND
SDH 97.02041	S-054-S	0.33 ± 0.16	ND	1.31 ± 0.22	0.514 ± 0.023	0.483 ± 0.028	ND	ND
SDH 97.02042	S-075-S	ND	ND	1.01 ± 0.23	0.395 ± 0.021	0.347 ± 0.023	ND	ND
SDH 97.02043	S-074-S	ND	ND	1.45 ± 0.28	0.540 ± 0.028	0.484 ± 0.030	ND	ND
SDH 97.02044	S-073-S	ND	ND	1.33 ± 0.26	0.517 ± 0.025	0.454 ± 0.025	ND	ND
SDH 97.02045	S-077-S	ND	1.24 ± 1.23	1.10 ± 0.23	0.431 ± 0.024	0.382 ± 0.022	0.068 ± 0.014	ND
SDH 97.02046	S-102-S	0.32 ± 0.16	1.38 ± 1.10	1.41 ± 0.21	0.488 ± 0.022	0.435 ± 0.025	0.089 ± 0.013	0.077 ± 0.044
SDH 97.02048	S-076-S	ND	ND	1.44 ± 0.28	0.505 ± 0.026	0.453 ± 0.026	0.089 ± 0.017	ND
SDH 97.02049	S-058-S	0.74 ± 0.19	1.68 ± 1.01	1.35 ± 0.23	0.600 ± 0.021	0.559 ± 0.022	0.083 ± 0.014	ND
SDH 97.02050	S-100-S	0.41 ± 0.16	ND	1.12 ± 0.28	0.485 ± 0.029	0.452 ± 0.033	0.068 ± 0.017	ND
SDH 97.02051	S-101-S	1.04 ± 0.16	1.41 ± 0.70	0.75 ± 0.18	0.335 ± 0.016	0.288 ± 0.016	ND	ND

TABLE A.11.a - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
SDH 97.02052	S-103-S	0.97 ± 0.21	1.21 ± 1.25	1.54 ± 0.22	0.573 ± 0.024	0.508 ± 0.025	0.093 ± 0.014	ND
SDH 97.02053	S-078-S	ND	ND	1.49 ± 0.23	0.517 ± 0.023	0.472 ± 0.025	ND	ND
SDH 97.02054	S-104-S	0.24 ± 0.12	ND	ND	0.407 ± 0.021	0.373 ± 0.022	0.085 ± 0.014	ND
SDH 97.02055	S-118-S	0.72 ± 0.24	ND	1.75 ± 0.25	0.561 ± 0.026	0.466 ± 0.029	0.107 ± 0.015	ND
SDH 97.02056	S-118-S-DUP	0.69 ± 0.17	ND	1.37 ± 0.27	0.468 ± 0.029	0.432 ± 0.032	0.0867 ± 0.0159	ND
SDH 97.02057	S-117-S	0.68 ± 0.19	1.19 ± 1.43	1.38 ± 0.23	0.496 ± 0.025	0.441 ± 0.026	ND	ND
SDH 97.02058	S-002-S	ND	ND	1.43 ± 0.24	0.463 ± 0.023	0.450 ± 0.024	0.0873 ± 0.0144	ND
SDH 97.02059	S-114-S	ND	ND	0.90 ± 0.24	0.393 ± 0.023	0.360 ± 0.022	ND	ND
SDH 97.02063	S-080-S	ND	ND	1.24 ± 0.23	0.476 ± 0.026	0.422 ± 0.029	0.0767 ± 0.0140	ND
SDH 97.02064	S-02B-S	0.64 ± 0.20	1.52 ± 1.14	1.40 ± 0.25	0.486 ± 0.026	0.452 ± 0.028	ND	ND
SDH 97.02065	S-052-S	0.39 ± 0.20	ND	1.30 ± 0.31	0.497 ± 0.032	0.443 ± 0.036	ND	ND
SDH 97.02066	S-059-S	ND	1.00 ± 1.06	1.24 ± 0.21	0.466 ± 0.021	0.445 ± 0.023	0.0763 ± 0.0129	ND
SDH 97.02067	S-055-S	ND	1.90 ± 1.46	1.53 ± 0.30	0.544 ± 0.027	0.527 ± 0.028	ND	ND
SDH 97.02071	S-081-S	ND	1.04 ± 1.13	0.63 ± 0.23	0.330 ± 0.022	0.312 ± 0.022	ND	ND
SDH 97.02073	S-01A-S	ND	ND	0.91 ± 0.23	0.395 ± 0.023	0.356 ± 0.026	ND	ND
SDH 97.02072	S-01A-S-DUP	ND	0.98 ± 0.85	0.71 ± 0.19	0.347 ± 0.017	0.322 ± 0.016	ND	ND
SDH 97.02074	S-03A-S	0.34 ± 0.19	ND	1.12 ± 0.24	0.465 ± 0.025	0.408 ± 0.025	ND	ND
SDH 97.02075	S-115-S	0.65 ± 0.18	0.63 ± 0.68	0.93 ± 0.18	0.350 ± 0.017	0.331 ± 0.017	0.0569 ± 0.0107	ND
SDH 97.02076	S-116-S	ND	ND	1.40 ± 0.28	0.589 ± 0.027	0.509 ± 0.029	0.0845 ± 0.0168	0.087 ± 0.057
SDH 97.02077	S-045-S	ND	ND	0.96 ± 0.20	0.382 ± 0.022	0.328 ± 0.025	0.0604 ± 0.0119	ND
SDH 97.02080	S-126-S	ND	ND	1.09 ± 0.23	0.476 ± 0.025	0.429 ± 0.029	ND	ND
SDH 97.02082	S-021-S	ND	0.87 ± 0.93	1.08 ± 0.24	0.453 ± 0.023	0.399 ± 0.022	ND	ND
SDH 97.02081	S-021-S-DUP	0.76 ± 0.22	ND	1.17 ± 0.22	0.458 ± 0.024	0.410 ± 0.026	ND	ND
SDH 97.02083	S-111-S	0.17 ± 0.11	ND	0.84 ± 0.22	0.369 ± 0.021	0.357 ± 0.021	0.0518 ± 0.0133	ND
SDH 97.02084	S-082-S	ND	ND	0.85 ± 0.26	0.466 ± 0.024	0.411 ± 0.024	ND	ND
SDH 97.02085	S-127-S	ND	ND	1.14 ± 0.22	0.501 ± 0.024	0.448 ± 0.025	0.0687 ± 0.0129	ND
SDH 97.02086	S-123-S	ND	ND	0.39 ± 0.14	0.196 ± 0.014	0.176 ± 0.013	ND	ND
SDH 97.02088	S-110-S	0.54 ± 0.14	1.04 ± 1.27	1.05 ± 0.18	0.401 ± 0.020	0.392 ± 0.022	ND	ND
SDH 97.02090	S-125-S	ND	ND	0.76 ± 0.23	0.337 ± 0.021	0.292 ± 0.022	ND	ND
SDH 97.02089	S-125-S-DUP	0.67 ± 0.21	ND	0.61 ± 0.23	0.347 ± 0.023	0.345 ± 0.027	ND	ND
SDH 97.02091	S-124-S	ND	ND	0.42 ± 0.22	0.284 ± 0.022	0.268 ± 0.021	ND	ND

TABLE A.11.a - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
STUDY SAMPLES - SHORELINE SEDIMENT								
SDH 97.01921	S-128-L	ND	0.78 ± 0.86	0.75 ± 0.18	0.293 ± 0.017	0.274 ± 0.018	ND	ND
SDH 97.01922	S-128-L-DUP	ND	ND	0.76 ± 0.20	0.419 ± 0.019	0.375 ± 0.020	ND	ND
SDH 97.01928	S-135-L	ND	ND	0.62 ± 0.19	0.257 ± 0.018	0.220 ± 0.020	ND	ND
SDH 97.01929	S-136-L	ND	ND	0.39 ± 0.18	0.212 ± 0.017	0.189 ± 0.017	ND	ND
SDH 97.01930	S-137-L	ND	ND	0.49 ± 0.16	0.325 ± 0.017	0.305 ± 0.020	ND	ND
SDH 97.01931	S-139-L	ND	ND	0.42 ± 0.18	0.193 ± 0.017	0.197 ± 0.019	ND	ND
SDH 97.01932	S-139-L-DUP	ND	ND	0.43 ± 0.16	0.156 ± 0.015	0.138 ± 0.016	ND	ND
SDH 97.02062	S-130-L	0.65 ± 0.15	ND	0.83 ± 0.17	0.358 ± 0.015	0.315 ± 0.015	ND	ND
SDH 97.02068	S-131-L	0.31 ± 0.18	1.19 ± 1.01	0.92 ± 0.21	0.548 ± 0.020	0.487 ± 0.020	ND	ND
SDH 97.02069	S-132-L	ND	ND	0.50 ± 0.18	0.296 ± 0.017	0.265 ± 0.019	ND	ND
SDH 97.02070	S-134-L	ND	ND	0.27 ± 0.14	0.132 ± 0.012	0.118 ± 0.011	ND	ND
SDH 97.02079	S-140-L	ND	0.75 ± 0.65	0.48 ± 0.16	0.253 ± 0.015	0.230 ± 0.014	ND	ND
BACKGROUND SAMPLES								
SDH 97.02047	S-119-S-BG	ND	ND	0.69 ± 0.18	0.350 ± 0.017	0.324 ± 0.017	ND	ND
SDH 97.02060	S-120-S-BG	ND	ND	0.40 ± 0.17	0.188 ± 0.017	0.157 ± 0.018	ND	ND
SDH 97.02061	S-121-S-BG	ND	ND	1.41 ± 0.26	0.657 ± 0.026	0.575 ± 0.026	0.087 ± 0.016	0.069 ± 0.058
SDH 97.02087	S-129-L-BG	ND	ND	0.54 ± 0.18	0.326 ± 0.018	0.288 ± 0.017	ND	ND
SDH 97.01936	S-133-L-BG	ND	ND	0.44 ± 0.19	0.201 ± 0.017	0.193 ± 0.019	ND	ND
SDH 97.02078	S-138-L-BG	0.44 ± 0.17	ND	1.25 ± 0.20	0.612 ± 0.020	0.580 ± 0.021	ND	ND

ND = Radionuclide was not detected by gamma spectrometry.

TABLE A.11.b
Gamma Spectrometry Results for Harbor and Shoreline Sediment Samples taken in San Diego Harbor
Thorium Chain and other Gamma Emitting Radionuclides

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)									
NAREL ID	Field Sample Number	^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDC	^{137}Cs	^{40}K
STUDY SAMPLES - HARBOR SEDIMENTS											
SDH 97.01918	S-107-S	0.432±0.032	0.60±0.22	0.546±0.024	0.47±0.13	0.178±0.012	ND	ND	0.020	0.1110 ±0.0107	13.50 ±0.30
SDH 97.01919	S-108-S	0.331±0.027	0.26±0.19	0.388±0.021	0.34±0.13	0.131±0.011	ND	ND	0.021	0.0420 ±0.0083	14.30 ±0.29
SDH 97.01924	S-108-S-DUP	0.356±0.027	0.34±0.21	0.383±0.021	0.31±0.14	0.125±0.012	0.135±0.076	ND	0.023	0.0415 ±0.0087	13.70 ±0.29
SDH 97.01920	S-113-S	0.393±0.030	0.38±0.24	0.485±0.022	0.38±0.13	0.159±0.012	0.060±0.058	ND	0.021	0.0482 ±0.0088	14.50 ±0.30
SDH 97.01923	S-020-S	0.362±0.033	0.45±0.21	0.476±0.024	0.45±0.14	0.150±0.013	ND	ND	0.020	0.0717 ±0.0096	12.70 ±0.30
SDH 97.01925	S-105-S	0.379±0.028	0.26±0.22	0.460±0.020	0.26±0.13	0.152±0.012	ND	ND	0.019	0.0391 ±0.0083	12.30 ±0.27
SDH 97.01926	S-109-S	0.487±0.029	0.44±0.22	0.636±0.023	0.61±0.11	0.209±0.012	0.332±0.084	ND	0.019	0.1220 ±0.0115	16.40 ±0.30
SDH 97.01927	S-112-S	0.374±0.030	0.28±0.19	0.438±0.021	0.45±0.12	0.142±0.012	0.223±0.073	ND	0.024	0.0527 ±0.0099	13.00 ±0.29
SDH 97.01933	S-027-S	0.453±0.026	0.49±0.23	0.555±0.021	0.55±0.12	0.184±0.011	ND	ND	0.018	0.1160 ±0.0104	15.90 ±0.28
SDH 97.01934	S-063-S	0.532±0.027	0.30±0.22	0.628±0.022	0.69±0.11	0.211±0.012	ND	ND	0.018	0.1120 ±0.0096	16.40 ±0.29
SDH 97.01942	S-025-S	0.513±0.034	0.46±0.24	0.564±0.023	0.60±0.14	0.194±0.014	ND	ND	0.025	0.0963 ±0.0117	14.80 ±0.34
SDH 97.01935	S-025-S-DUP	0.415±0.024	0.57±0.20	0.518±0.019	0.53±0.09	0.167±0.011	0.203±0.067	ND	0.015	0.0643 ±0.0083	14.20 ±0.26
SDH 97.01943	S-084-S	0.228±0.027	0.21±0.20	0.350±0.022	0.27±0.12	0.115±0.011	0.145±0.079	ND	0.027	0.0253 ±0.0088	13.70 ±0.35
SDH 97.01944	S-023-S	0.359±0.022	0.32±0.19	0.484±0.019	0.49±0.09	0.162±0.011	0.537±0.081	ND	0.016	0.0737 ±0.0082	15.30 ±0.26
SDH 97.01945	S-122-S	0.287±0.028	0.34±0.21	0.317±0.021	0.26±0.12	0.104±0.011	ND	ND	0.018	0.0159 ±0.0081	15.00 ±0.29
SDH 97.01946	S-019-S	0.263±0.020	0.24±0.18	0.348±0.017	0.36±0.09	0.102±0.009	0.293±0.068	ND	0.014	0.0328 ±0.0069	14.00 ±0.23
SDH 97.01947	S-106-S	0.270±0.026	0.24±0.24	0.356±0.020	0.30±0.13	0.116±0.011	0.238±0.088	ND	0.020	0.0234 ±0.0092	14.00 ±0.31
SDH 97.02040	S-048-S	0.472±0.025	0.63±0.20	0.588±0.020	0.59±0.09	0.191±0.010	0.096±0.085	ND	0.014	0.0696 ±0.0081	15.00 ±0.26
SDH 97.02041	S-054-S	0.682±0.034	0.81±0.25	0.837±0.026	0.74±0.14	0.272±0.014	ND	ND	0.025	0.1380 ±0.0119	16.00 ±0.34
SDH 97.02042	S-075-S	0.448±0.030	0.55±0.22	0.598±0.023	0.61±0.12	0.191±0.012	0.107±0.077	ND	0.021	0.0795 ±0.0098	13.60 ±0.29
SDH 97.02043	S-074-S	0.582±0.041	0.53±0.28	0.733±0.035	0.72±0.19	0.232±0.017	ND	ND	0.031	0.0663 ±0.0125	14.50 ±0.40
SDH 97.02044	S-073-S	0.577±0.037	0.69±0.27	0.723±0.029	0.67±0.15	0.237±0.015	ND	ND	0.021	0.1010 ±0.0119	15.90 ±0.33
SDH 97.02045	S-077-S	0.476±0.030	0.69±0.25	0.675±0.026	0.66±0.15	0.206±0.013	0.236±0.092	ND	0.022	0.0694 ±0.0097	12.70 ±0.27
SDH 97.02046	S-102-S	0.644±0.035	0.41±0.26	0.762±0.025	0.63±0.14	0.247±0.014	ND	ND	0.021	0.1420 ±0.0114	17.30 ±0.30
SDH 97.02048	S-076-S	0.616±0.038	0.660±0.29	0.772±0.029	0.737±0.12	0.255±0.015	ND	ND	0.023	0.1030 ±0.0124	15.20 ±0.31
SDH 97.02049	S-058-S	0.569±0.027	0.534±0.23	0.728±0.024	0.701±0.10	0.213±0.012	0.106±0.074	ND	0.017	0.1170 ±0.0097	17.30 ±0.28

TABLE A.11.b - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)									
NAREL ID	Field Sample Number	^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDC	^{137}Cs	^{40}K
SDH 97.02050	S-100-S	0.518±0.041	0.58±0.28	0.589±0.026	0.49±0.17	0.196±0.018	ND	ND	0.030	0.0474 ±0.0146	13.6 ±0.5
SDH 97.02051	S-101-S	0.295±0.020	0.18±0.17	0.365±0.017	0.25±0.10	0.119±0.009	0.164±0.069	ND	0.013	0.0242 ±0.0074	13.70 ±0.23
SDH 97.02052	S-103-S	0.560±0.031	0.45±0.26	0.673±0.025	0.63±0.13	0.216±0.014	ND	ND	0.021	0.0759 ±0.0104	15.50 ±0.32
SDH 97.02053	S-078-S	0.624±0.033	0.55±0.24	0.710±0.025	0.63±0.14	0.229±0.013	ND	ND	0.023	0.1320 ±0.0111	16.20 ±0.31
SDH 97.02054	S-104-S	0.515±0.033	0.41±0.19	0.697±0.025	0.65±0.13	0.234±0.013	ND	ND	0.019	0.1080 ±0.0105	13.30 ±0.29
SDH 97.02055	S-118-S	0.639±0.039	0.35±0.23	0.793±0.029	0.65±0.16	0.263±0.017	ND	ND	0.031	0.1160 ±0.0151	15.80 ±0.41
SDH 97.02056	S-118-S-DUP	0.565±0.042	0.65±0.30	0.680±0.028	0.50±0.19	0.227±0.018	ND	ND	0.035	0.0966 ±0.0154	15.00 ±0.48
SDH 97.02057	S-117-S	0.611±0.034	0.58±0.27	0.722±0.026	0.61±0.13	0.227±0.014	ND	ND	0.024	0.0957 ±0.0118	16.30 ±0.34
SDH 97.02058	S-002-S	0.697±0.034	0.56±0.24	0.792±0.026	0.78±0.13	0.261±0.013	ND	ND	0.021	0.1200 ±0.0106	13.20 ±0.28
SDH 97.02059	S-114-S	0.378±0.031	0.32±0.21	0.457±0.022	0.44±0.13	0.148±0.013	ND	ND	0.020	0.0338 ±0.0091	14.60 ±0.30
SDH 97.02063	S-080-S	0.424±0.035	0.52±0.27	0.585±0.027	0.46±0.15	0.193±0.015	0.233±0.119	ND	0.031	0.0543 ±0.0133	15.70 ±0.42
SDH 97.02064	S-02B-S	0.640±0.036	0.56±0.30	0.692±0.027	0.72±0.15	0.227±0.015	ND	ND	0.025	0.1210 ±0.0127	16.10 ±0.34
SDH 97.02065	S-052-S	0.634±0.047	0.61±0.34	0.823±0.033	0.73±0.20	0.271±0.020	ND	ND	0.034	0.1500 ±0.0199	16.30 ±0.54
SDH 97.02066	S-059-S	0.503±0.031	0.51±0.21	0.632±0.024	0.56±0.13	0.204±0.012	ND	ND	0.023	0.1080 ±0.0098	15.60 ±0.30
SDH 97.02067	S-055-S	0.629±0.039	0.81±0.30	0.838±0.031	0.74±0.16	0.281±0.016	0.091±0.099	ND	0.024	0.1100 ±0.0124	16.60 ±0.34
SDH 97.02071	S-081-S	0.279±0.031	0.45±0.24	0.370±0.022	0.35±0.11	0.116±0.012	ND	ND	0.023	0.0268 ±0.0080	14.30 ±0.29
SDH 97.02073	S-01A-S	0.383±0.033	0.39±0.24	0.470±0.024	0.39±0.16	0.158±0.014	ND	ND	0.031	0.0388 ±0.0109	14.90 ±0.40
SDH 97.02072	S-01A-S-DUP	0.377±0.022	0.37±0.21	0.432±0.018	0.37±0.09	0.139±0.010	0.080±0.068	ND	0.015	0.0453 ±0.0072	14.60 ±0.24
SDH 97.02074	S-03A-S	0.513±0.033	0.64±0.29	0.581±0.025	0.38±0.13	0.193±0.013	ND	ND	0.023	0.1020 ±0.0119	15.40 ±0.33
SDH 97.02075	S-115-S	0.353±0.021	0.26±0.21	0.400±0.018	0.36±0.10	0.141±0.009	ND	ND	0.015	0.0482 ±0.0080	13.10 ±0.23
SDH 97.02076	S-116-S	0.562±0.040	0.68±0.29	0.844±0.029	0.74±0.15	0.257±0.017	ND	ND	0.030	0.0593 ±0.0138	15.60 ±0.40
SDH 97.02077	S-045-S	0.407±0.034	0.34±0.24	0.499±0.023	0.43±0.14	0.154±0.014	ND	ND	0.028	0.0297 ±0.0105	13.70 ±0.37
SDH 97.02080	S-126-S	0.454±0.036	0.42±0.24	0.566±0.025	0.47±0.16	0.175±0.016	ND	ND	0.032	0.0778 ±0.0137	14.90 ±0.39
SDH 97.02082	S-021-S	0.402±0.030	0.44±0.22	0.517±0.024	0.51±0.13	0.174±0.013	0.130±0.112	ND	0.021	0.0586 ±0.0091	14.40 ±0.30
SDH 97.02081	S-021-S-DUP	0.417±0.031	0.44±0.26	0.557±0.025	0.45±0.12	0.171±0.014	ND	ND	0.023	0.0619 ±0.0105	14.30 ±0.33
SDH 97.02083	S-111-S	0.341±0.027	0.34±0.25	0.435±0.022	0.41±0.12	0.159±0.012	0.151±0.088	ND	0.021	0.0635 ±0.0095	12.50 ±0.28
SDH 97.02084	S-082-S	0.383±0.030	0.35±0.24	0.526±0.025	0.53±0.13	0.163±0.013	0.173±0.125	ND	0.026	0.0712 ±0.0110	14.60 ±0.30
SDH 97.02085	S-127-S	0.467±0.032	0.49±0.28	0.575±0.024	0.64±0.12	0.179±0.013	ND	ND	0.021	0.0772 ±0.0115	14.00 ±0.29
SDH 97.02086	S-123-S	0.145±0.017	ND	0.174±0.014	0.13±0.09	0.055±0.007	ND	ND	0.014	0.0105 ±0.0052	13.60 ±0.22

TABLE A.11.b - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)									
NAREL ID	Field Sample Number	^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDC	^{137}Cs	^{40}K
SDH 97.02088	S-110-S	0.380±0.029	0.54±0.22	0.475±0.020	0.56±0.10	0.157±0.012	ND	ND	0.023	0.0570 ±0.0091	13.20 ±0.31
SDH 97.02090	S-125-S	0.316±0.027	0.34±0.19	0.362±0.023	0.20±0.12	0.128±0.012	ND	ND	0.022	0.0418 ±0.0083	14.00 ±0.29
SDH 97.02089	S-125-S-DUP	0.276±0.034	ND	0.383±0.024	0.30±0.14	0.120±0.015	ND	ND	0.031	0.0458 ±0.0112	14.10 ±0.39
SDH 97.02091	S-124-S	0.233±0.028	ND	0.297±0.022	0.35±0.13	0.100±0.012	ND	ND	0.020	0.0287 ±0.0084	13.90 ±0.30
STUDY SAMPLES - SHORELINE SEDIMENT											
SDH 97.01921	S-128-L	0.274±0.024	0.37±0.19	0.281±0.017	0.29±0.10	0.097±0.009	ND	ND	0.018	ND	13.50 ±0.25
SDH 97.01922	S-128-L-DUP	0.372±0.028	0.30±0.21	0.411±0.020	0.39±0.10	0.133±0.011	ND	ND	0.019	ND	12.80 ±0.25
SDH 97.01928	S-135-L	0.201±0.026	ND	0.250±0.018	0.22±0.11	0.081±0.010	ND	ND	0.025	ND	12.80 ±0.33
SDH 97.01929	S-136-L	0.158±0.023	ND	0.178±0.017	0.26±0.08	0.058±0.009	ND	ND	0.017	0.0062 ±0.0058	13.20 ±0.25
SDH 97.01930	S-137-L	0.149±0.024	0.24±0.15	0.176±0.015	0.12±0.12	0.051±0.009	ND	ND	0.023	0.0175 ±0.0074	13.10 ±0.32
SDH 97.01931	S-139-L	0.122±0.021	ND	0.169±0.016	0.12±0.07	0.053±0.009	ND	ND	0.017	ND	13.20 ±0.28
SDH 97.01932	S-139-L-DUP	0.132±0.019	ND	0.142±0.015	0.12±0.07	0.043±0.008	ND	ND	0.016	ND	12.30 ±0.24
SDH 97.02062	S-130-L	0.328±0.019	0.27±0.17	0.372±0.016	0.36±0.08	0.108±0.008	ND	ND	0.012	0.0052 ±0.0054	11.80 ±0.20
SDH 97.02068	S-131-L	0.438±0.026	0.34±0.20	0.533±0.021	0.47±0.12	0.168±0.011	ND	ND	0.019	ND	10.20 ±0.22
SDH 97.02069	S-132-L	0.252±0.024	ND	0.280±0.018	0.21±0.11	0.089±0.010	ND	ND	0.018	0.0059 ±0.0056	14.60 ±0.26
SDH 97.02070	S-134-L	0.103±0.015	ND	0.111±0.012	0.11±0.06	0.035±0.007	ND	ND	0.012	0.0043 ±0.0043	14.10 ±0.21
SDH 97.02079	S-140-L	0.245±0.017	0.24±0.18	0.263±0.015	0.27±0.08	0.081±0.007	ND	ND	0.013	ND	12.60 ±0.21
BACKGROUND SAMPLES											
SDH 97.02047	S-119-S-BG	0.332±0.020	0.23±0.17	0.392±0.018	0.45±0.08	0.124±0.009	ND	ND	0.014	0.0238 ±0.0061	11.90 ±0.22
SDH 97.02060	S-120-S-BG	0.150±0.023	0.20±0.20	0.172±0.017	0.16±0.11	0.060±0.010	ND	ND	0.019	ND	14.60 ±0.26
SDH 97.02061	S-121-S-BG	0.608±0.035	0.62±0.27	0.739±0.027	0.77±0.13	0.237±0.014	ND	ND	0.023	ND	14.50 ±0.29
SDH 97.02087	S-129-L-BG	0.309±0.024	0.300±0.18	0.314±0.018	0.319±0.08	0.110±0.009	ND	ND	0.018	ND	14.10 ±0.25
SDH 97.01936	S-133-L-BG	0.124±0.023	0.20±0.17	0.195±0.018	0.21±0.11	0.057±0.009	ND	ND	0.020	0.0101 ±0.0066	15.00 ±0.28
SDH 97.02078	S-138-L-BG	0.680±0.027	0.54±0.20	0.774±0.022	0.74±0.11	0.248±0.012	ND	ND	0.017	ND	10.80 ±0.23

ND = Radionuclide was not detected by gamma spectrometry.

TABLE A.12
Gross Alpha and Gross Beta Results for Harbor and Shoreline Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
STUDY SAMPLES - HARBOR SEDIMENTS			
SDH 97.01918	S-107-S	17.7 ± 7.7	19.7 ± 4.2
SDH 97.01919	S-108-S	4.5 ± 4.7	17.7 ± 4.2
SDH 97.01924	S-108-S-DUP	5.3 ± 5.8	17.8 ± 4.2
SDH 97.01920	S-113-S	15.1 ± 7.7	18.8 ± 4.2
SDH 97.01923	S-020-S	8.2 ± 5.4	19.7 ± 4.2
SDH 97.01925	S-105-S	8.4 ± 5.7	18.9 ± 3.7
SDH 97.01926	S-109-S	8.4 ± 5.4	19.6 ± 3.7
SDH 97.01927	S-112-S	4.5 ± 5.0	19.2 ± 3.8
SDH 97.01933	S-027-S	20.5 ± 8.0	22.7 ± 3.9
SDH 97.01934	S-063-S	22.8 ± 8.8	25.6 ± 4.2
SDH 97.01942	S-025-S	13.4 ± 6.3	23.0 ± 3.8
SDH 97.01935	S-025-S-DUP	13.7 ± 7.0	19.4 ± 3.7
SDH 97.01943	S-084-S	2.6 ± 6.2	17.0 ± 3.9
SDH 97.01944	S-023-S	10.3 ± 5.8	18.0 ± 4.2
SDH 97.01945	S-122-S	4.6 ± 5.3	16.2 ± 4.2
SDH 97.01946	S-019-S	8.3 ± 6.6	17.4 ± 4.1
SDH 97.01947	S-106-S	8.7 ± 6.1	18.0 ± 4.1
SDH 97.02040	S-048-S	4.7 ± 5.9	18.3 ± 4.0
SDH 97.02041	S-054-S	6.8 ± 7.5	25.8 ± 4.4
SDH 97.02042	S-075-S	11.7 ± 6.2	20.3 ± 3.7
SDH 97.02043	S-074-S	11.6 ± 6.4	18.8 ± 3.8
SDH 97.02044	S-073-S	12.3 ± 6.5	17.5 ± 3.6
SDH 97.02045	S-077-S	6.6 ± 5.5	14.4 ± 3.3
SDH 97.02046	S-102-S	12.4 ± 6.5	21.4 ± 3.7
SDH 97.02048	S-076-S	8.0 ± 5.4	19.0 ± 3.7
SDH 97.02049	S-058-S	14.3 ± 7.1	23.3 ± 4.0
SDH 97.02050	S-100-S	13.1 ± 6.8	19.8 ± 3.6
SDH 97.02051	S-101-S	8.5 ± 5.7	16.8 ± 3.5
SDH 97.02052	S-103-S	5.8 ± 4.9	16.5 ± 3.5

TABLE A.12 - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.02053	S-078-S	13.4 ± 6.9	21.1 ± 3.8
SDH 97.02054	S-104-S	15.0 ± 6.9	20.8 ± 3.7
SDH 97.02055	S-118-S	15.2 ± 7.8	22.3 ± 4.2
SDH 97.02056	S-118-S-DUP	12.9 ± 7.1	20.3 ± 4.0
SDH 97.02057	S-117-S	20.8 ± 8.8	22.3 ± 4.4
SDH 97.02058	S-002-S	9.8 ± 6.6	18.3 ± 4.4
SDH 97.02059	S-114-S	1.3 ± 6.3	16.5 ± 4.1
SDH 97.02063	S-080-S	10.0 ± 5.8	22.4 ± 3.9
SDH 97.02064	S-02B-S	10.8 ± 6.5	20.5 ± 3.8
SDH 97.02065	S-052-S	14.4 ± 7.2	21.7 ± 3.8
SDH 97.02066	S-059-S	15.1 ± 6.8	20.7 ± 3.7
SDH 97.02067	S-055-S	8.7 ± 5.5	19.2 ± 3.5
SDH 97.02071	S-081-S	3.8 ± 4.2	18.2 ± 3.6
SDH 97.02073	S-01A-S	10.4 ± 6.3	20.0 ± 3.8
SDH 97.02072	S-01A-S-DUP	7.7 ± 5.9	14.7 ± 3.6
SDH 97.02074	S-03A-S	8.9 ± 5.8	16.1 ± 3.5
SDH 97.02075	S-115-S	7.5 ± 5.5	19.7 ± 3.7
SDH 97.02076	S-116-S	15.4 ± 6.9	22.1 ± 3.8
SDH 97.02077	S-045-S	2.4 ± 4.8	15.5 ± 3.5
SDH 97.02080	S-126-S	2.9 ± 4.6	19.5 ± 3.6
SDH 97.02082	S-021-S	11.1 ± 5.8	19.9 ± 3.6
SDH 97.02081	S-021-S-DUP	11.1 ± 6.0	17.7 ± 3.5
SDH 97.02083	S-111-S	19.1 ± 8.0	22.7 ± 3.9
SDH 97.02084	S-082-S	9.8 ± 6.4	18.2 ± 3.6
SDH 97.02085	S127-S	4.2 ± 4.8	18.8 ± 3.6
SDH 97.02086	S123-S	4.9 ± 4.7	19.2 ± 3.6
SDH 97.02088	S-110-S	9.5 ± 6.5	21.3 ± 3.9
SDH 97.02090	S-125-S	7.3 ± 5.4	17.4 ± 3.5
SDH 97.02089	S-125-S-DUP	8.7 ± 5.9	21.4 ± 3.9
SDH 97.02091	S-124-S	5.1 ± 4.6	19.2 ± 3.6

TABLE A.12 - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
STUDY SAMPLES - SHORELINE SEDIMENTS			
SDH 97.01921	S-128-L	4.0 ± 3.7	16.2 ± 3.9
SDH 97.01922	S-128-L-DUP	3.3 ± 5.5	16.7 ± 3.8
SDH 97.01928	S-135-L	4.3 ± 4.9	12.3 ± 3.3
SDH 97.01929	S-136-L	-1.0 ± 3.2	12.1 ± 3.1
SDH 97.01930	S-137-L	-0.2 ± 2.5	17.8 ± 3.5
SDH 97.01931	S-139-L	0.3 ± 3.3	15.3 ± 3.4
SDH 97.01932	S-139-L-DUP	0.1 ± 3.5	13.3 ± 3.3
SDH 97.02062	S-130-L	3.9 ± 3.9	11.7 ± 3.1
SDH 97.02068	S-131-L	11.1 ± 6.4	15.0 ± 3.4
SDH 97.02069	S-132-L	3.8 ± 4.4	17.4 ± 3.6
SDH 97.02070	S-134-L	0.6 ± 3.4	12.6 ± 3.2
SDH 97.02079	S-140-L	-0.8 ± 3.2	16.1 ± 3.4
BACKGROUND SAMPLES			
SDH 97.02047	S-119-S-BG	7.7 ± 5.2	19.0 ± 3.5
SDH 97.02060	S-120-S-BG	0.0 ± 3.8	15.5 ± 3.9
SDH 97.02061	S-121-S-BG	6.1 ± 5.9	17.2 ± 4.0
SDH 97.02087	S-129-L-BG	0.8 ± 3.0	19.5 ± 3.6
SDH 97.01936	S-133-L-BG	8.0 ± 5.6	14.8 ± 3.4
SDH 97.02078	S-138-L-BG	1.8 ± 4.1	14.5 ± 3.4

TABLE A.13
Radium-226 Results for Harbor Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)
NAREL Sample ID	Field Sample Number	^{226}Ra
97.01934J	S-063-S	0.869 ± 0.048
97.02041H	S-054-S	0.394 ± 0.034
97.02054N	S-104-S	0.580 ± 0.040
97.02057R	S-117-S	0.496 ± 0.038
97.02063P	S-080-S	0.390 ± 0.034
97.02083U	S-111-S	0.531 ± 0.036
BACKGROUND SAMPLES		
97.02047P	S-119-S-BG	0.449 ± 0.034
97.02060L	S-120-S-BG	0.245 ± 0.029
97.02061M	S-121-S-BG	0.597 ± 0.040

Note: Harbor Sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for radium-226 content. None of the Harbor Sediment water samples contained the highest gross alpha or gross beta concentrations. Therefore, radium-226 analysis was not conducted for study Harbor Sediment samples. All background samples were analyzed for radium-226.

TABLE A.14
Uranium Results for Harbor Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)		
NAREL Sample ID	Field Sample Number	^{234}U	^{235}U	^{238}U
SDH 97.01934	S-063-S	0.90 ± 0.17	0.103 ± 0.059	0.77 ± 0.15
SDH 97.02041	S-054-S	0.89 ± 0.13	0.028 ± 0.023	1.00 ± 0.14
SDH 97.02054	S-104-S	1.09 ± 0.17	0.047 ± 0.035	0.92 ± 0.15
SDH 97.02057	S-117-S	1.04 ± 0.23	0.082 ± 0.067	0.97 ± 0.22
SDH 97.02063	S-080-S	0.61 ± 0.12	0.023 ± 0.029	0.48 ± 0.11
SDH 97.02083	S-111-S	0.66 ± 0.17	0.048 ± 0.055	0.66 ± 0.17
BACKGROUND SAMPLES				
SDH 97.02047	S-119-S-BG	0.59 ± 0.11	0.042 ± 0.032	0.42 ± 0.10
SDH 97.02060	S-120-S-BG	0.36 ± 0.09	0.039 ± 0.032	0.26 ± 0.08
SDH 97.02061	S-121-S-BG	0.62 ± 0.12	0.054 ± 0.036	0.55 ± 0.11

Note: Harbor sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for uranium content. None of the study harbor sediment samples contained the highest gross alpha or gross beta concentrations. Therefore, uranium analysis was not conducted for study harbor sediment samples. All background samples were analyzed for uranium.

TABLE A.15
Thorium Results for Harbor Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)			
NAREL Sample ID	Field Sample Number	^{227}Th	^{228}Th	^{230}Th	^{232}Th
SDH 97.01934	S-063-S	0.095 ± 0.083	0.69 ± 0.19	0.65 ± 0.14	0.83 ± 0.16
SDH 97.02041	S-054-S	0.034 ± 0.037	0.89 ± 0.13	0.82 ± 0.12	1.03 ± 0.13
SDH 97.02054	S-104-S	0.078 ± 0.059	0.92 ± 0.16	0.76 ± 0.13	1.03 ± 0.15
SDH 97.02057	S-117-S	0.132 ± 0.083	0.50 ± 0.15	0.71 ± 0.14	0.88 ± 0.16
SDH 97.02063	S-080-S	0.037 ± 0.033	0.70 ± 0.11	0.50 ± 0.08	0.72 ± 0.10
SDH 97.02083	S-111-S	0.056 ± 0.071	0.41 ± 0.17	0.60 ± 0.14	0.59 ± 0.14
BACKGROUND SAMPLES					
SDH 97.02047	S-119-S-BG	0.003 ± 0.021	0.39 ± 0.12	0.39 ± 0.09	0.45 ± 0.10
SDH 97.02060	S-120-S-BG	0.003 ± 0.026	0.29 ± 0.09	0.23 ± 0.06	0.27 ± 0.07
SDH 97.02061	S-121-S-BG	0.106 ± 0.055	0.47 ± 0.10	0.45 ± 0.08	0.43 ± 0.08

Note: Harbor sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for thorium content. None of the study harbor sediment samples contained the highest gross alpha or gross beta concentrations. Therefore, thorium analysis was not conducted for study harbor sediment samples. All background samples were analyzed for thorium.

TABLE A.16
Plutonium Results for Harbor Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	^{238}Pu	$^{239/240}Pu$
SDH 97.01934	S-063-S	-0.016 ± 0.012	0.014 ± 0.025
SDH 97.02041	S-054-S	0.009 ± 0.017	0.004 ± 0.012
SDH 97.02054	S-104-S	0.009 ± 0.022	0.003 ± 0.020
SDH 97.02057	S-117-S	0.002 ± 0.019	0.000 ± 0.014
SDH 97.02063	S-080-S	-0.010 ± 0.016	0.001 ± 0.008
SDH 97.02083	S-111-S	0.009 ± 0.054	0.009 ± 0.026
BACKGROUND SAMPLES			
SDH 97.02047	S-119-S-BG	-0.005 ± 0.033	0.032 ± 0.026
SDH 97.02060	S-120-S-BG	0.003 ± 0.032	-0.011 ± 0.008
SDH 97.02061	S-121-S-BG	-0.005 ± 0.024	-0.002 ± 0.004

Note: Harbor sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for plutonium content. None of the study harbor sediment samples contained the highest gross alpha or gross beta concentrations. Therefore, plutonium analysis was not conducted for study harbor sediment samples. All background samples were analyzed for plutonium.

TABLE A.17.a
Gamma Spectrometry Results for Core Sediment Samples taken in San Diego Harbor
Uranium and Actinium Chain Gamma Emitting Radionuclides - Displayed by Core

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
SDH 97.02134	S-021-C, TOP 5 CM	0.81 ± 0.43	5.2 ± 5.9	0.99 ± 0.78	0.301 ± 0.085	0.239 ± 0.108	ND	ND
SDH 97.02135	S-021-C, 2ND 5 CM	ND	ND	1.18 ± 0.51	0.405 ± 0.046	0.424 ± 0.060	ND	ND
SDH 97.02136	S-021-C, 3RD 5 CM	1.01 ± 0.40	ND	0.85 ± 0.56	0.401 ± 0.051	0.349 ± 0.062	ND	ND
SDH 97.02137	S-021-C, BOTTOM 10.5 CM	0.43 ± 0.15	2.0 ± 2.0	ND	0.398 ± 0.032	0.333 ± 0.034	0.064 ± 0.019	0.079 ± 0.058
SDH 97.02125	S-021-C-DUP, TOP 5CM	0.65 ± 0.29	ND	0.93 ± 0.47	0.376 ± 0.048	0.326 ± 0.056	ND	ND
SDH 97.02126	S-021-C-DUP, 2ND 5 CM	ND	ND	0.89 ± 0.35	0.329 ± 0.033	0.278 ± 0.039	ND	ND
SDH 97.02127	S-021-C-DUP, BOTTOM 8.5 CM	ND	ND	0.71 ± 0.25	0.255 ± 0.024	0.235 ± 0.026	ND	ND
SDH 97.02138	S-076-C, TOP 5 CM	ND	ND	0.61 ± 0.78	ND	0.192 ± 0.090	ND	ND
SDH 97.02139	S-076-C, 2ND 5 CM	0.63 ± 0.47	ND	ND	0.399 ± 0.080	0.280 ± 0.096	ND	ND
SDH 97.02140	S-076-C, 3RD 5 CM	ND	ND	1.08 ± 0.74	0.345 ± 0.067	0.331 ± 0.073	ND	ND
SDH 97.02141	S-076-C, BOTTOM 12 CM	ND	ND	1.33 ± 0.40	0.373 ± 0.036	0.335 ± 0.043	0.084 ± 0.024	ND
SDH 97.02142	S-058-C, TOP 5 CM	ND	ND	0.78 ± 0.72	0.312 ± 0.076	0.353 ± 0.089	ND	ND
SDH 97.02143	S-058-C, 2ND 5 CM	ND	ND	0.94 ± 0.78	0.412 ± 0.075	0.389 ± 0.099	0.067 ± 0.047	ND
SDH 97.02144	S-058-C, 3RD 5 CM	ND	ND	0.73 ± 0.83	0.347 ± 0.083	0.323 ± 0.089	ND	ND
SDH 97.02145	S-058-C, BOTTOM 9 CM	ND	ND	0.75 ± 0.34	0.361 ± 0.033	0.317 ± 0.041	ND	ND
SDH 97.02150	S-054-C, TOP 5 CM	ND	ND	1.01 ± 1.09	0.413 ± 0.097	0.338 ± 0.110	ND	ND
SDH 97.02151	S-054-C, 2ND 5 CM	ND	ND	1.19 ± 0.97	0.389 ± 0.104	0.293 ± 0.127	ND	ND
SDH 97.02152	S-054-C, 3RD 5 CM	ND	ND	1.23 ± 0.84	0.445 ± 0.076	0.346 ± 0.092	ND	ND
SDH 97.02153	S-054-C, BOTTOM 12 CM	ND	ND	1.32 ± 0.36	0.525 ± 0.038	0.467 ± 0.041	ND	ND
SDH 97.02154	S-048-C, TOP 5 CM	ND	ND	0.88 ± 0.73	0.247 ± 0.073	0.197 ± 0.084	ND	ND
SDH 97.02155	S-048-C, 2ND 5 CM	0.50 ± 0.30	ND	1.30 ± 0.52	0.479 ± 0.052	0.415 ± 0.062	ND	ND
SDH 97.02156	S-048-C, 3RD 5 CM	0.89 ± 0.43	ND	1.82 ± 0.73	0.500 ± 0.063	0.440 ± 0.073	ND	ND
SDH 97.02157	S-048-C, BOTTOM 12 CM	1.14 ± 0.41	ND	1.67 ± 0.50	0.486 ± 0.043	0.431 ± 0.049	0.105 ± 0.030	ND
SDH 97.02158	S-063-C, TOP 5 CM	ND	ND	ND	0.389 ± 0.073	0.428 ± 0.099	ND	ND
SDH 97.02159	S-063-C, 2ND 5 CM	ND	ND	1.42 ± 0.63	0.456 ± 0.060	0.422 ± 0.070	ND	ND
SDH 97.02160	S-063-C, BOTTOM 8 CM	ND	ND	1.54 ± 0.38	0.500 ± 0.043	0.424 ± 0.055	0.096 ± 0.023	ND
SDH 97.02164	S-025-C, TOP 5 CM	ND	ND	1.06 ± 0.71	0.386 ± 0.066	0.308 ± 0.079	ND	ND
SDH 97.02165	S-025-C, 2ND 5 CM	0.54 ± 0.40	ND	0.95 ± 0.64	0.446 ± 0.070	0.352 ± 0.086	0.063 ± 0.039	ND
SDH 97.02166	S-025-C, 3RD 5 CM	ND	ND	1.39 ± 0.65	0.485 ± 0.059	0.492 ± 0.068	ND	ND
SDH 97.02167	S-025-C, 4TH 5 CM	ND	ND	0.81 ± 0.55	0.556 ± 0.045	0.431 ± 0.059	ND	ND
SDH 97.02168	S-025-C, BOTTOM 15.5 CM	0.45 ± 0.20	ND	ND	0.603 ± 0.030	0.534 ± 0.031	0.095 ± 0.017	ND

TABLE A.17.a - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
SDH 97.02161	S-025-C-DUP, TOP 5 CM	ND	ND	1.03 ± 0.69	0.337 ± 0.067	0.287 ± 0.085	ND	ND
SDH 97.02162	S-025-C-DUP, 2ND 5 CM	ND	ND	0.86 ± 0.73	0.374 ± 0.076	0.344 ± 0.078	ND	ND
SDH 97.02163	S-025-C-DUP, BOTTOM 8 CM	ND	ND	1.07 ± 0.36	0.362 ± 0.036	0.366 ± 0.039	ND	ND
SDH 97.02169	S-027-C, TOP 5 CM	ND	ND	0.47 ± 0.69	0.447 ± 0.063	0.400 ± 0.074	0.036 ± 0.042	ND
SDH 97.02170	S-027-C, 2ND 5 CM	ND	ND	1.15 ± 0.65	0.414 ± 0.068	0.287 ± 0.085	ND	ND
SDH 97.02171	S-027-C, BOTTOM 8 CM	ND	ND	0.96 ± 0.37	0.449 ± 0.043	0.383 ± 0.051	ND	ND
SDH 97.02172	S-111-C, TOP 5 CM	1.68 ± 0.72	ND	ND	0.433 ± 0.100	0.314 ± 0.113	ND	ND
SDH 97.02173	S-111-C, 2ND 5 CM	ND	ND	ND	0.372 ± 0.076	0.277 ± 0.078	ND	ND
SDH 97.02174	S-111-C, 3RD 5 CM	ND	ND	0.97 ± 0.71	0.411 ± 0.069	0.338 ± 0.078	ND	ND
SDH 97.02175	S-111-C, BOTTOM 10 CM	0.69 ± 0.24	ND	1.15 ± 0.44	0.468 ± 0.044	0.398 ± 0.052	ND	ND
SDH 97.02176	S-082-C, TOP 5 CM	1.52 ± 0.51	5.8 ± 4.0	1.14 ± 0.88	0.402 ± 0.083	0.413 ± 0.095	ND	ND
SDH 97.02177	S-082-C, BOTTOM 5 CM	ND	ND	ND	0.388 ± 0.081	0.330 ± 0.124	ND	ND
BACKGROUND SAMPLES								
SDH 97.02128	S-120-C-BG, TOP 5 CM	ND	ND	0.34 ± 0.33	0.164 ± 0.031	0.144 ± 0.034	ND	ND
SDH 97.02129	S-120-C-BG, 2ND 5 CM	0.23 ± 0.17	ND	0.40 ± 0.30	0.191 ± 0.029	0.162 ± 0.036	ND	ND
SDH 97.02130	S-120-C-BG, 3RD 5 CM	ND	ND	0.32 ± 0.31	0.192 ± 0.027	0.149 ± 0.029	ND	ND
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	ND	ND	0.27 ± 0.21	0.177 ± 0.021	0.171 ± 0.022	0.018 ± 0.013	ND
SDH 97.02132	S-121-C-BG, TOP 5 CM	0.58 ± 0.29	ND	0.88 ± 0.51	0.467 ± 0.056	0.380 ± 0.062	ND	ND
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	ND	ND	1.27 ± 0.40	0.510 ± 0.038	0.487 ± 0.043	0.080 ± 0.024	ND
SDH 97.02146	S-119-C-BG, TOP 5 CM	0.39 ± 0.24	ND	0.92 ± 0.45	0.352 ± 0.042	0.297 ± 0.052	ND	ND
SDH 97.02147	S-119-C-BG, 2ND 5 CM	0.35 ± 0.21	ND	0.76 ± 0.37	0.361 ± 0.034	0.326 ± 0.034	ND	ND
SDH 97.02148	S-119-C-BG, 3RD 5 CM	ND	ND	0.83 ± 0.40	0.305 ± 0.035	0.283 ± 0.041	ND	ND
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	0.62 ± 0.23	ND	0.86 ± 0.34	0.375 ± 0.032	0.366 ± 0.037	ND	ND

ND = Radionuclide was not detected by gamma spectrometry.

TABLE A.17.b
Gamma Spectrometry Results for Core Sediment Samples taken in San Diego Harbor
Thorium Chain and other Gamma Emitting Radionuclides - Displayed by Core

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)									
NAREL Sample ID	Field Sample Number	^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDA	^{137}Cs	^{40}K
SDH 97.02134	S-021-C, TOP 5 CM	0.431 ± 0.106	ND	0.501 ± 0.073	0.43 ± 0.43	0.164 ± 0.051	ND	ND	0.094	0.04 ± 0.032	13.60 ± 0.96
SDH 97.02135	S-021-C, 2ND 5 CM	0.458 ± 0.072	ND	0.588 ± 0.047	0.63 ± 0.32	0.174 ± 0.028	0.26 ± 0.23	ND	0.066	0.07 ± 0.026	15.70 ± 0.81
SDH 97.02136	S-021-C, 3RD 5 CM	0.452 ± 0.072	0.54 ± 0.47	0.508 ± 0.053	0.73 ± 0.29	0.144 ± 0.030	0.39 ± 0.23	ND	0.059	0.06 ± 0.019	15.10 ± 0.64
SDH 97.02137	S-021-C, BOTTOM 10.5 CM	0.406 ± 0.048	0.50 ± 0.30	0.519 ± 0.033	0.56 ± 0.23	0.160 ± 0.018	0.28 ± 0.13	ND	0.029	0.05 ± 0.012	14.00 ± 0.43
SDH 97.02125	S-021-C-DUP, TOP 5CM	0.492 ± 0.066	0.54 ± 0.54	0.534 ± 0.043	0.69 ± 0.28	0.173 ± 0.028	0.28 ± 0.16	ND	0.056	0.06 ± 0.021	15.20 ± 0.64
SDH 97.02126	S-021-C-DUP, 2ND 5 CM	0.309 ± 0.046	0.28 ± 0.26	0.354 ± 0.034	0.33 ± 0.19	0.104 ± 0.020	ND	ND	0.036	0.01 ± 0.013	11.40 ± 0.43
SDH 97.02127	S-021-C-DUP, BOTTOM 8.5	0.256 ± 0.033	0.34 ± 0.26	0.277 ± 0.024	0.21 ± 0.19	0.089 ± 0.014	ND	ND	0.027	0.01 ± 0.011	9.63 ± 0.30
SDH 97.02138	S-076-C, TOP 5 CM	0.455 ± 0.115	ND	0.480 ± 0.078	0.44 ± 0.67	0.148 ± 0.054	ND	ND	0.108	0.07 ± 0.038	13.60 ± 0.89
SDH 97.02139	S-076-C, 2ND 5 CM	0.502 ± 0.131	ND	0.559 ± 0.078	ND	0.181 ± 0.051	ND	ND	0.092	0.09 ± 0.031	14.40 ± 0.92
SDH 97.02140	S-076-C, 3RD 5 CM	0.536 ± 0.090	ND	0.644 ± 0.073	0.84 ± 0.40	0.191 ± 0.043	ND	ND	0.068	0.10 ± 0.033	16.00 ± 0.79
SDH 97.02141	S-076-C, BOTTOM 12 CM	0.635 ± 0.063	0.67 ± 0.39	0.637 ± 0.040	0.87 ± 0.21	0.224 ± 0.023	ND	ND	0.043	0.10 ± 0.017	16.40 ± 0.53
SDH 97.02142	S-058-C, TOP 5 CM	0.507 ± 0.100	ND	0.526 ± 0.068	0.32 ± 0.34	0.191 ± 0.046	ND	ND	0.087	0.08 ± 0.032	14.80 ± 0.90
SDH 97.02143	S-058-C, 2ND 5 CM	0.464 ± 0.103	ND	0.468 ± 0.073	0.62 ± 0.47	0.140 ± 0.048	ND	ND	0.090	0.08 ± 0.033	14.80 ± 0.87
SDH 97.02144	S-058-C, 3RD 5 CM	0.638 ± 0.129	ND	0.490 ± 0.080	ND	0.168 ± 0.048	ND	ND	0.075	0.10 ± 0.033	13.90 ± 0.86
SDH 97.02145	S-058-C, BOTTOM 9 CM	0.524 ± 0.051	0.35 ± 0.37	0.467 ± 0.035	0.56 ± 0.27	0.153 ± 0.022	ND	ND	0.040	0.09 ± 0.016	14.90 ± 0.48
SDH 97.02150	S-054-C, TOP 5 CM	0.706 ± 0.159	ND	0.741 ± 0.092	0.62 ± 0.72	0.256 ± 0.064	0.71 ± 0.65	ND	0.101	0.08 ± 0.041	12.20 ± 1.03
SDH 97.02151	S-054-C, 2ND 5 CM	0.592 ± 0.133	0.80 ± 1.05	0.723 ± 0.092	0.81 ± 0.50	0.263 ± 0.064	ND	ND	0.127	0.12 ± 0.044	14.20 ± 1.20
SDH 97.02152	S-054-C, 3RD 5 CM	0.571 ± 0.104	1.06 ± 0.75	0.721 ± 0.077	1.02 ± 0.39	0.229 ± 0.048	ND	ND	0.089	0.13 ± 0.033	14.90 ± 0.88
SDH 97.02153	S-054-C, BOTTOM 12 CM	0.805 ± 0.062	0.75 ± 0.38	0.751 ± 0.040	0.69 ± 0.22	0.270 ± 0.023	ND	ND	0.043	0.11 ± 0.018	15.60 ± 0.54
SDH 97.02154	S-048-C, TOP 5 CM	0.382 ± 0.102	0.78 ± 0.86	0.404 ± 0.070	ND	0.131 ± 0.046	ND	ND	0.087	0.07 ± 0.035	13.20 ± 0.81
SDH 97.02155	S-048-C, 2ND 5 CM	0.541 ± 0.082	0.72 ± 0.65	0.594 ± 0.052	0.49 ± 0.36	0.187 ± 0.036	ND	ND	0.056	0.05 ± 0.020	16.10 ± 0.67
SDH 97.02156	S-048-C, 3RD 5 CM	0.641 ± 0.084	ND	0.725 ± 0.065	0.98 ± 0.39	0.239 ± 0.039	ND	ND	0.071	0.09 ± 0.028	14.60 ± 0.71
SDH 97.02157	S-048-C, BOTTOM 12 CM	0.933 ± 0.075	1.00 ± 0.47	0.878 ± 0.048	1.06 ± 0.26	0.267 ± 0.027	ND	ND	0.052	0.14 ± 0.021	16.40 ± 0.58
SDH 97.02158	S-063-C, TOP 5 CM	0.392 ± 0.128	ND	0.495 ± 0.069	ND	0.130 ± 0.052	ND	ND	0.107	0.06 ± 0.047	12.80 ± 1.22
SDH 97.02159	S-063-C, 2ND 5 CM	0.376 ± 0.094	0.93 ± 0.57	0.576 ± 0.060	0.76 ± 0.33	0.185 ± 0.041	ND	ND	0.077	0.09 ± 0.028	14.60 ± 0.80
SDH 97.02160	S-063-C, BOTTOM 8 CM	0.523 ± 0.068	0.34 ± 0.39	0.522 ± 0.041	0.33 ± 0.28	0.177 ± 0.029	ND	ND	0.067	0.09 ± 0.024	16.10 ± 0.70
SDH 97.02164	S-025-C, TOP 5 CM	0.431 ± 0.105	ND	0.465 ± 0.065	0.93 ± 0.46	0.162 ± 0.044	ND	ND	0.088	0.07 ± 0.032	13.70 ± 0.82
SDH 97.02165	S-025-C, 2ND 5 CM	0.402 ± 0.107	ND	0.487 ± 0.072	0.56 ± 0.38	0.174 ± 0.047	ND	ND	0.085	0.07 ± 0.028	13.40 ± 0.80
SDH 97.02166	S-025-C, 3RD 5 CM	0.522 ± 0.080	ND	0.528 ± 0.062	0.62 ± 0.47	0.165 ± 0.036	ND	ND	0.060	0.08 ± 0.026	15.10 ± 0.72
SDH 97.02167	S-025-C, 4TH 5 CM	0.542 ± 0.084	ND	0.561 ± 0.051	ND	0.185 ± 0.032	ND	ND	0.060	0.08 ± 0.019	16.20 ± 0.66
SDH 97.02168	S-025-C, BOTTOM 15.5 CM	0.668 ± 0.045	0.62 ± 0.31	0.715 ± 0.030	0.57 ± 0.15	0.222 ± 0.017	ND	0.022 ± 0.012	NC	0.09 ± 0.014	17.10 ± 0.41

TABLE A.17.b - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)									
NAREL Sample ID	Field Sample Number	^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDA	^{137}Cs	^{40}K
SDH 97.02161	S-025-C-DUP, TOP 5 CM	0.360 ± 0.104	ND	0.418 ± 0.061	0.51 ± 0.42	0.160 ± 0.043	ND	ND	0.075	0.04 ± 0.033	11.10 ± 0.80
SDH 97.02162	S-025-C-DUP, 2ND 5 CM	0.445 ± 0.095	ND	0.482 ± 0.075	ND	0.133 ± 0.045	ND	ND	0.080	0.08 ± 0.028	13.10 ± 0.81
SDH 97.02163	S-025-C-DUP, BOTTOM 8	0.467 ± 0.051	0.46 ± 0.41	0.449 ± 0.035	0.49 ± 0.23	0.163 ± 0.021	ND	ND	0.036	0.06 ± 0.016	12.90 ± 0.46
SDH 97.02169	S-027-C, TOP 5 CM	0.420 ± 0.097	ND	0.525 ± 0.064	0.49 ± 0.35	0.165 ± 0.040	ND	ND	0.082	0.11 ± 0.030	14.70 ± 0.83
SDH 97.02170	S-027-C, 2ND 5 CM	0.543 ± 0.103	ND	0.463 ± 0.065	0.60 ± 0.35	0.159 ± 0.044	ND	ND	0.087	0.10 ± 0.031	12.80 ± 0.86
SDH 97.02171	S-027-C, BOTTOM 8 CM	0.396 ± 0.062	ND	0.473 ± 0.040	ND	0.137 ± 0.029	ND	ND	0.054	0.08 ± 0.024	14.70 ± 0.67
SDH 97.02172	S-111-C, TOP 5 CM	ND	ND	0.457 ± 0.100	0.67 ± 0.59	0.121 ± 0.060	ND	ND	0.118	0.06 ± 0.039	13.80 ± 1.07
SDH 97.02173	S-111-C, 2ND 5 CM	0.381 ± 0.107	ND	0.501 ± 0.072	0.65 ± 0.49	0.151 ± 0.044	0.46 ± 0.37	ND	0.068	0.05 ± 0.027	11.80 ± 0.76
SDH 97.02174	S-111-C, 3RD 5 CM	0.349 ± 0.101	ND	0.472 ± 0.065	0.66 ± 0.40	0.166 ± 0.044	ND	ND	0.092	0.09 ± 0.031	13.90 ± 0.83
SDH 97.02175	S-111-C, BOTTOM 10 CM	0.480 ± 0.066	0.46 ± 0.54	0.518 ± 0.043	0.61 ± 0.22	0.154 ± 0.026	ND	ND	0.049	0.11 ± 0.020	16.00 ± 0.59
SDH 97.02176	S-082-C, TOP 5 CM	ND	ND	0.453 ± 0.080	ND	0.136 ± 0.049	0.91 ± 0.47	ND	0.093	0.10 ± 0.035	15.40 ± 0.93
SDH 97.02177	S-082-C, BOTTOM 5 CM	0.332 ± 0.169	ND	0.461 ± 0.092	ND	0.129 ± 0.067	ND	ND	0.143	0.09 ± 0.040	12.90 ± 1.13
BACKGROUND SAMPLES											
SDH 97.02128	S-120-C-BG, TOP 5 CM	0.177 ± 0.050	ND	0.198 ± 0.030	ND	0.057 ± 0.019	ND	ND	0.035	ND	14.50 ± 0.48
SDH 97.02129	S-120-C-BG, 2ND 5 CM	0.206 ± 0.049	ND	0.179 ± 0.031	ND	0.054 ± 0.020	ND	ND	0.039	ND	16.30 ± 0.50
SDH 97.02130	S-120-C-BG, 3RD 5 CM	0.161 ± 0.033	ND	0.173 ± 0.027	0.25 ± 0.17	0.060 ± 0.016	ND	ND	0.029	ND	17.50 ± 0.44
SDH 97.02131	S-120-C-BG, BOTTOM 12	0.162 ± 0.031	ND	0.168 ± 0.020	0.25 ± 0.11	0.059 ± 0.012	ND	ND	0.026	ND	15.60 ± 0.36
SDH 97.02132	S-121-C-BG, TOP 5 CM	0.455 ± 0.069	0.42 ± 0.56	0.506 ± 0.043	0.47 ± 0.36	0.138 ± 0.034	ND	ND	0.074	ND	13.40 ± 0.82
SDH 97.02133	S-121-C-BG, BOTTOM 4	0.627 ± 0.053	0.94 ± 0.36	0.711 ± 0.039	0.75 ± 0.22	0.198 ± 0.025	ND	ND	0.043	ND	14.90 ± 0.52
SDH 97.02146	S-119-C-BG, TOP 5 CM	0.370 ± 0.068	ND	0.417 ± 0.044	0.25 ± 0.32	0.163 ± 0.029	ND	ND	0.051	0.02 ± 0.018	14.00 ± 0.58
SDH 97.02147	S-119-C-BG, 2ND 5 CM	0.445 ± 0.044	0.60 ± 0.40	0.432 ± 0.033	0.49 ± 0.20	0.128 ± 0.020	ND	ND	0.038	0.03 ± 0.013	14.40 ± 0.45
SDH 97.02148	S-119-C-BG, 3RD 5 CM	0.338 ± 0.057	0.37 ± 0.34	0.394 ± 0.035	0.63 ± 0.21	0.128 ± 0.021	ND	ND	0.042	0.03 ± 0.016	13.20 ± 0.48
SDH 97.02149	S-119-C-BG, BOTTOM 11	0.435 ± 0.046	0.35 ± 0.33	0.452 ± 0.027	0.49 ± 0.20	0.143 ± 0.019	ND	ND	0.038	0.02 ± 0.013	13.10 ± 0.53

ND = Radionuclide was not detected by gamma spectrometry.
NC = Not calculated. The MDC is not calculated when the radionuclide is detected and quantified by the gamma spectrometry software.

TABLE A.17.c
Gamma Spectrometry Results for Core Sediment Samples taken in San Diego Harbor
Uranium and Actinium Chain Gamma Emitting Radionuclides - Displayed by Depth

STUDY SAMPLES		Activity (pCi / g-dry weight + 2sigma counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
STUDY SAMPLES - TOP DEPTH								
SDH 97.02134	S-021-C, TOP 5 CM	0.81 ± 0.43	5.2 ± 5.9	0.99 ± 0.78	0.301 ± 0.085	0.239 ± 0.108	ND	ND
SDH 97.02125	S-021-C-DUP, TOP 5CM	0.65 ± 0.29	ND	0.93 ± 0.47	0.376 ± 0.048	0.326 ± 0.056	ND	ND
SDH 97.02138	S-076-C, TOP 5 CM	ND	ND	0.61 ± 0.78	ND	0.192 ± 0.090	ND	ND
SDH 97.02142	S-058-C, TOP 5 CM	ND	ND	0.78 ± 0.72	0.312 ± 0.076	0.353 ± 0.089	ND	ND
SDH 97.02150	S-054-C, TOP 5 CM	ND	ND	1.01 ± 1.09	0.413 ± 0.097	0.338 ± 0.110	ND	ND
SDH 97.02154	S-048-C, TOP 5 CM	ND	ND	0.88 ± 0.73	0.247 ± 0.073	0.197 ± 0.084	ND	ND
SDH 97.02158	S-063-C, TOP 5 CM	ND	ND	ND	0.389 ± 0.073	0.428 ± 0.099	ND	ND
SDH 97.02164	S-025-C, TOP 5 CM	ND	ND	1.06 ± 0.71	0.386 ± 0.066	0.308 ± 0.079	ND	ND
SDH 97.02161	S-025-C-DUP, TOP 5 CM	ND	ND	1.03 ± 0.69	0.337 ± 0.067	0.287 ± 0.085	ND	ND
SDH 97.02169	S-027-C, TOP 5 CM	ND	ND	0.47 ± 0.69	0.447 ± 0.063	0.400 ± 0.074	0.036 ± 0.042	ND
SDH 97.02172	S-111-C, TOP 5 CM	1.68 ± 0.72	ND	ND	0.433 ± 0.100	0.314 ± 0.113	ND	ND
SDH 97.02176	S-082-C, TOP 5 CM	1.52 ± 0.51	5.8 ± 4.0	1.14 ± 0.88	0.402 ± 0.083	0.413 ± 0.095	ND	ND
BACKGROUND SAMPLES - TOP DEPTH								
SDH 97.02128	S-120-C-BG, TOP 5 CM	ND	ND	0.34 ± 0.33	0.164 ± 0.031	0.144 ± 0.034	ND	ND
SDH 97.02132	S-121-C-BG, TOP 5 CM	0.58 ± 0.29	ND	0.88 ± 0.51	0.467 ± 0.056	0.380 ± 0.062	ND	ND
SDH 97.02146	S-119-C-BG, TOP 5 CM	0.39 ± 0.24	ND	0.92 ± 0.45	0.352 ± 0.042	0.297 ± 0.052	ND	ND
STUDY SAMPLES - SECOND DEPTH								
SDH 97.02135	S-021-C, 2ND 5 CM	ND	ND	1.18 ± 0.51	0.405 ± 0.046	0.424 ± 0.060	ND	ND
SDH 97.02126	S-021-C-DUP, 2ND 5 CM	ND	ND	0.89 ± 0.35	0.329 ± 0.033	0.278 ± 0.039	ND	ND
SDH 97.02139	S-076-C, 2ND 5 CM	0.63 ± 0.47	ND	ND	0.399 ± 0.080	0.280 ± 0.096	ND	ND
SDH 97.02143	S-058-C, 2ND 5 CM	ND	ND	0.94 ± 0.78	0.412 ± 0.075	0.389 ± 0.099	0.067 ± 0.047	ND
SDH 97.02151	S-054-C, 2ND 5 CM	ND	ND	1.19 ± 0.97	0.389 ± 0.104	0.293 ± 0.127	ND	ND
SDH 97.02155	S-048-C, 2ND 5 CM	0.50 ± 0.30	ND	1.30 ± 0.52	0.479 ± 0.052	0.415 ± 0.062	ND	ND
SDH 97.02159	S-063-C, 2ND 5 CM	ND	ND	1.42 ± 0.63	0.456 ± 0.060	0.422 ± 0.070	ND	ND
SDH 97.02165	S-025-C, 2ND 5 CM	0.54 ± 0.40	ND	0.95 ± 0.64	0.446 ± 0.070	0.352 ± 0.086	0.063 ± 0.039	ND
SDH 97.02177	S-082-C, BOTTOM 5 CM	ND	ND	ND	0.388 ± 0.081	0.330 ± 0.124	ND	ND
SDH 97.02162	S-025-C-DUP, 2ND 5 CM	ND	ND	0.86 ± 0.73	0.374 ± 0.076	0.344 ± 0.078	ND	ND
SDH 97.02170	S-027-C, 2ND 5 CM	ND	ND	1.15 ± 0.65	0.414 ± 0.068	0.287 ± 0.085	ND	ND
SDH 97.02173	S-111-C, 2ND 5 CM	ND	ND	ND	0.372 ± 0.076	0.277 ± 0.078	ND	ND

TABLE A.17.c - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight + 2sigma counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
BACKGROUND SAMPLES - SECOND DEPTH								
SDH 97.02129	S-120-C-BG, 2ND 5 CM	0.23 ± 0.17	ND	0.40 ± 0.30	0.191 ± 0.029	0.162 ± 0.036	ND	ND
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	ND	ND	1.27 ± 0.40	0.510 ± 0.038	0.487 ± 0.043	0.080 ± 0.024	ND
SDH 97.02147	S-119-C-BG, 2ND CM	0.35 ± 0.21	ND	0.76 ± 0.37	0.361 ± 0.034	0.326 ± 0.034	ND	ND
STUDY SAMPLES - THIRD DEPTH								
SDH 97.02136	S-021-C, 3RD 5 CM	1.01 ± 0.40	ND	0.85 ± 0.56	0.401 ± 0.051	0.349 ± 0.062	ND	ND
SDH 97.02127	S-021-C-DUP, BOTTOM 8.5 CM	ND	ND	0.71 ± 0.25	0.255 ± 0.024	0.235 ± 0.026	ND	ND
SDH 97.02140	S-076-C, 3RD 5 CM	ND	ND	1.08 ± 0.74	0.345 ± 0.067	0.331 ± 0.073	ND	ND
SDH 97.02144	S-058-C, 3RD 5 CM	ND	ND	0.73 ± 0.83	0.347 ± 0.083	0.323 ± 0.089	ND	ND
SDH 97.02152	S-054-C, 3RD 5 CM	ND	ND	1.23 ± 0.84	0.445 ± 0.076	0.346 ± 0.092	ND	ND
SDH 97.02156	S-048-C, 3RD 5 CM	0.89 ± 0.43	ND	1.82 ± 0.73	0.500 ± 0.063	0.440 ± 0.073	ND	ND
SDH 97.02160	S-063-C, BOTTOM 8 CM	ND	ND	1.54 ± 0.38	0.500 ± 0.043	0.424 ± 0.055	0.096 ± 0.023	ND
SDH 97.02166	S-025-C, 3RD 5 CM	ND	ND	1.39 ± 0.65	0.485 ± 0.059	0.492 ± 0.068	ND	ND
SDH 97.02163	S-025-C-DUP, BOTTOM 8 CM	ND	ND	1.07 ± 0.36	0.362 ± 0.036	0.366 ± 0.039	ND	ND
SDH 97.02171	S-027-C, BOTTOM 8 CM	ND	ND	0.96 ± 0.37	0.449 ± 0.043	0.383 ± 0.051	ND	ND
SDH 97.02174	S-111-C, 3RD 5 CM	ND	ND	0.97 ± 0.71	0.411 ± 0.069	0.338 ± 0.078	ND	ND
BACKGROUND SAMPLES - THIRD DEPTH								
SDH 97.02130	S120-C-BG, 3RD 5 CM	ND	ND	0.32 ± 0.31	0.192 ± 0.027	0.149 ± 0.029	ND	ND
SDH 97.02148	S119-C-BG, 3RD 5 CM	ND	ND	0.83 ± 0.40	0.305 ± 0.035	0.283 ± 0.041	ND	ND
STUDY SAMPLES - FOURTH DEPTH								
SDH 97.02137	S021-C, BOTTOM 10.5 CM	0.43 ± 0.15	2.0 ± 2.0	ND	0.398 ± 0.032	0.333 ± 0.034	0.064 ± 0.019	0.079 ± 0.058
SDH 97.02141	S076-C, BOTTOM 12 CM	ND	ND	1.33 ± 0.40	0.373 ± 0.036	0.335 ± 0.043	0.084 ± 0.024	ND
SDH 97.02145	S058-C, BOTTOM 9 CM	ND	ND	0.75 ± 0.34	0.361 ± 0.033	0.317 ± 0.041	ND	ND
SDH 97.02153	S054-C, BOTTOM 12 CM	ND	ND	1.32 ± 0.36	0.525 ± 0.038	0.467 ± 0.041	ND	ND
SDH 97.02157	S048-C, BOTTOM 12 CM	1.14 ± 0.41	ND	1.67 ± 0.50	0.486 ± 0.043	0.431 ± 0.049	0.105 ± 0.030	ND
SDH 97.02167	S-025-C, 4TH 5 CM	ND	ND	0.81 ± 0.55	0.556 ± 0.045	0.431 ± 0.059	ND	ND
SDH 97.02175	S-111-C, BOTTOM 10 CM	0.69 ± 0.24	ND	1.15 ± 0.44	0.468 ± 0.044	0.398 ± 0.052	ND	ND

TABLE A.17.c - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight + 2sigma counting error)						
NAREL Sample ID	Field Sample Number	^{234}Th	^{234m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U	^{223}Ra
BACKGROUND SAMPLES - FOURTH DEPTH								
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	ND	ND	0.27 ± 0.21	0.177 ± 0.021	0.171 ± 0.022	0.018 ± 0.013	ND
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	0.62 ± 0.23	ND	0.86 ± 0.34	0.375 ± 0.032	0.366 ± 0.037	ND	ND
STUDY SAMPLES - FIFTH DEPTH								
SDH 97.02168	S-025-C, BOTTOM 15.5 CM	0.45 ± 0.20	ND	ND	0.603 ± 0.030	0.534 ± 0.031	0.095 ± 0.017	ND

ND = Radionuclide was not detected by gamma spectrometry.

TABLE A.17.d
Gamma Spectrometry Results for Core Sediment Samples taken in San Diego Harbor
Thorium Chain and other Gamma Emitting Radionuclides - Displayed by Depth

		Activity (pCi / g-dry weight ± 2σ counting error)									
NAREL Sample ID	Field Sample Number	^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDA	^{137}Cs	^{40}K
STUDY SAMPLES - TOP DEPTH											
SDH 97.02134	S-021-C, TOP 5 CM	0.43 ± 0.11	ND	0.501 ± 0.073	0.43 ± 0.43	0.164 ± 0.051	ND	ND	0.094	0.043 ± 0.032	13.60 ± 0.96
SDH 97.02125	S-021-C-DUP, TOP 5CM	0.49 ± 0.07	0.54 ± 0.54	0.534 ± 0.043	0.69 ± 0.28	0.173 ± 0.028	0.28 ± 0.16	ND	0.056	0.060 ± 0.021	15.20 ± 0.64
SDH 97.02138	S-076-C, TOP 5 CM	0.46 ± 0.12	ND	0.480 ± 0.078	0.44 ± 0.67	0.148 ± 0.054	ND	ND	0.108	0.075 ± 0.038	13.60 ± 0.89
SDH 97.02142	S-058-C, TOP 5 CM	0.51 ± 0.10	ND	0.526 ± 0.068	0.32 ± 0.34	0.191 ± 0.046	ND	ND	0.087	0.083 ± 0.032	14.80 ± 0.90
SDH 97.02150	S-054-C, TOP 5 CM	0.71 ± 0.16	ND	0.741 ± 0.092	0.62 ± 0.72	0.256 ± 0.064	0.71 ± 0.65	ND	0.101	0.085 ± 0.041	12.20 ± 1.03
SDH 97.02154	S-048-C, TOP 5 CM	0.38 ± 0.10	0.78 ± 0.86	0.404 ± 0.070	ND	0.131 ± 0.046	ND	ND	0.087	0.073 ± 0.035	13.20 ± 0.81
SDH 97.02158	S-063-C, TOP 5 CM	0.39 ± 0.13	ND	0.495 ± 0.069	ND	0.130 ± 0.052	ND	ND	0.107	0.067 ± 0.047	12.80 ± 1.22
SDH 97.02164	S-025-C, TOP 5 CM	0.43 ± 0.11	ND	0.465 ± 0.065	0.93 ± 0.46	0.162 ± 0.044	ND	ND	0.088	0.071 ± 0.032	13.70 ± 0.82
SDH 97.02161	S-025-C-DUP, TOP 5 CM	0.36 ± 0.10	ND	0.418 ± 0.061	0.51 ± 0.42	0.160 ± 0.043	ND	ND	0.075	0.042 ± 0.033	11.10 ± 0.80
SDH 97.02169	S-027-C, TOP 5 CM	0.42 ± 0.10	ND	0.525 ± 0.064	0.49 ± 0.35	0.165 ± 0.040	ND	ND	0.082	0.112 ± 0.030	14.70 ± 0.83
SDH 97.02172	S-111-C, TOP 5 CM	ND	ND	0.457 ± 0.100	0.67 ± 0.59	0.121 ± 0.060	ND	ND	0.118	0.066 ± 0.039	13.80 ± 1.07
SDH 97.02176	S-082-C, TOP 5 CM	ND	ND	0.453 ± 0.080	ND	0.136 ± 0.049	0.91 ± 0.47	ND	0.093	0.100 ± 0.035	15.40 ± 0.93
BACKGROUND SAMPLES - TOP DEPTH											
SDH 97.02128	S-120-C-BG, TOP 5 CM	0.18 ± 0.05	ND	0.198 ± 0.030	ND	0.057 ± 0.019	ND	ND	0.035	ND	14.50 ± 0.48
SDH 97.02132	S-121-C-BG, TOP 5 CM	0.46 ± 0.07	0.42 ± 0.56	0.506 ± 0.043	0.47 ± 0.36	0.138 ± 0.034	ND	ND	0.074	ND	13.40 ± 0.82
SDH 97.02146	S-119-C-BG, TOP 5 CM	0.37 ± 0.07	ND	0.417 ± 0.044	0.25 ± 0.32	0.163 ± 0.029	ND	ND	0.051	0.029 ± 0.018	14.00 ± 0.58
STUDY SAMPLES - SECOND DEPTH											
SDH 97.02135	S-021-C, 2ND 5 CM	0.46 ± 0.07	ND	0.588 ± 0.047	0.63 ± 0.32	0.174 ± 0.028	0.26 ± 0.23	ND	0.066	0.073 ± 0.026	15.70 ± 0.81
SDH 97.02126	S-021-C-DUP, 2ND 5 CM	0.31 ± 0.05	0.28 ± 0.26	0.354 ± 0.034	0.33 ± 0.19	0.104 ± 0.020	ND	ND	0.036	0.017 ± 0.013	11.40 ± 0.43
SDH 97.02139	S-076-C, 2ND 5 CM	0.50 ± 0.13	ND	0.559 ± 0.078	ND	0.181 ± 0.051	ND	ND	0.092	0.094 ± 0.031	14.40 ± 0.92
SDH 97.02143	S-058-C, 2ND 5 CM	0.46 ± 0.10	ND	0.468 ± 0.073	0.62 ± 0.47	0.140 ± 0.048	ND	ND	0.090	0.084 ± 0.033	14.80 ± 0.87
SDH 97.02151	S-054-C, 2ND 5 CM	0.59 ± 0.13	0.80 ± 1.05	0.723 ± 0.092	0.81 ± 0.50	0.263 ± 0.064	ND	ND	0.127	0.120 ± 0.044	14.20 ± 1.20
SDH 97.02155	S-048-C, 2ND 5 CM	0.54 ± 0.08	0.72 ± 0.65	0.594 ± 0.052	0.49 ± 0.36	0.187 ± 0.036	ND	ND	0.056	0.057 ± 0.020	16.10 ± 0.67
SDH 97.02159	S-063-C, 2ND 5 CM	0.38 ± 0.09	0.93 ± 0.57	0.576 ± 0.060	0.76 ± 0.33	0.185 ± 0.041	ND	ND	0.077	0.091 ± 0.028	14.60 ± 0.80
SDH 97.02165	S-025-C, 2ND 5 CM	0.40 ± 0.11	ND	0.487 ± 0.072	0.56 ± 0.38	0.174 ± 0.047	ND	ND	0.085	0.075 ± 0.028	13.40 ± 0.80
SDH 97.02162	S-025-C-DUP, 2ND 5 CM	0.45 ± 0.10	ND	0.482 ± 0.075	ND	0.133 ± 0.045	ND	ND	0.080	0.089 ± 0.028	13.10 ± 0.81
SDH 97.02170	S-027-C, 2ND 5 CM	0.54 ± 0.10	ND	0.463 ± 0.065	0.60 ± 0.35	0.159 ± 0.044	ND	ND	0.087	0.107 ± 0.031	12.80 ± 0.86
SDH 97.02177	S-082-C, BOTTOM 5 CM	0.33 ± 0.17	ND	0.461 ± 0.092	ND	0.129 ± 0.067	ND	ND	0.143	0.095 ± 0.040	12.90 ± 1.13
SDH 97.02173	S-111-C, 2ND 5 CM	0.38 ± 0.11	ND	0.501 ± 0.072	0.65 ± 0.49	0.151 ± 0.044	0.46 ± 0.37	ND	0.068	0.059 ± 0.027	11.80 ± 0.76

TABLE A.17.d - *Continued*

NAREL Sample ID	Field Sample Number	Activity (pCi / g-dry weight ± 2σ counting error)									
		^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDA	^{137}Cs	^{40}K
BACKGROUND SAMPLES - SECOND DEPTH											
SDH 97.02129	S-120-C-BG, 2ND 5 CM	0.21 ± 0.05	ND	0.179 ± 0.031	ND	0.054 ± 0.020	ND	ND	0.039	ND	16.30 ± 0.50
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	0.63 ± 0.05	0.94 ± 0.36	0.711 ± 0.039	0.75 ± 0.22	0.198 ± 0.025	ND	ND	0.043	ND	14.90 ± 0.52
SDH 97.02147	S-119-C-BG, 2ND CM	0.45 ± 0.04	0.60 ± 0.40	0.432 ± 0.033	0.49 ± 0.20	0.128 ± 0.020	ND	ND	0.038	0.034 ± 0.013	14.40 ± 0.45
STUDY SAMPLES - THIRD DEPTH											
SDH 97.02136	S-021-C, 3RD 5 CM	0.45 ± 0.07	0.54 ± 0.47	0.508 ± 0.053	0.73 ± 0.29	0.144 ± 0.030	0.39 ± 0.23	ND	0.059	0.065 ± 0.019	15.10 ± 0.64
SDH 97.02127	S-021-C-DUP, BOTTOM 8.5CM	0.26 ± 0.03	0.34 ± 0.26	0.277 ± 0.024	0.21 ± 0.19	0.089 ± 0.014	ND	ND	0.027	0.011 ± 0.011	9.63 ± 0.30
SDH 97.02140	S-076-C, 3RD 5 CM	0.54 ± 0.09	ND	0.644 ± 0.073	0.84 ± 0.40	0.191 ± 0.043	ND	ND	0.068	0.104 ± 0.033	16.00 ± 0.79
SDH 97.02144	S-058-C, 3RD 5 CM	0.64 ± 0.13	ND	0.490 ± 0.080	ND	0.168 ± 0.048	ND	ND	0.075	0.102 ± 0.033	13.90 ± 0.86
SDH 97.02152	S-054-C, 3RD 5 CM	0.57 ± 0.10	1.06 ± 0.75	0.721 ± 0.077	1.02 ± 0.39	0.229 ± 0.048	ND	ND	0.089	0.133 ± 0.033	14.90 ± 0.88
SDH 97.02156	S-048-C, 3RD 5 CM	0.64 ± 0.08	ND	0.725 ± 0.065	0.98 ± 0.39	0.239 ± 0.039	ND	ND	0.071	0.090 ± 0.028	14.60 ± 0.71
SDH 97.02160	S-063-C, BOTTOM 8 CM	0.52 ± 0.07	0.34 ± 0.39	0.522 ± 0.041	0.33 ± 0.28	0.177 ± 0.029	ND	ND	0.067	0.098 ± 0.024	16.10 ± 0.70
SDH 97.02166	S-025-C, 3RD 5 CM	0.52 ± 0.08	ND	0.528 ± 0.062	0.62 ± 0.47	0.165 ± 0.036	ND	ND	0.060	0.083 ± 0.026	15.10 ± 0.72
SDH 97.02163	S-025-C-DUP, BOTTOM 8 CM	0.47 ± 0.05	0.46 ± 0.41	0.449 ± 0.035	0.49 ± 0.23	0.163 ± 0.021	ND	ND	0.036	0.066 ± 0.016	12.90 ± 0.46
SDH 97.02171	S-027-C, BOTTOM 8 CM	0.40 ± 0.06	ND	0.473 ± 0.040	ND	0.137 ± 0.029	ND	ND	0.054	0.081 ± 0.024	14.70 ± 0.67
SDH 97.02174	S-111-C, 3RD 5 CM	0.35 ± 0.10	ND	0.472 ± 0.065	0.66 ± 0.40	0.166 ± 0.044	ND	ND	0.092	0.093 ± 0.031	13.90 ± 0.83
BACKGROUND SAMPLES - THIRD DEPTH											
SDH 97.02130	S-120-C-BG, 3RD 5 CM	0.16 ± 0.03	ND	0.173 ± 0.027	0.25 ± 0.17	0.060 ± 0.016	ND	ND	0.029	ND	17.50 ± 0.44
SDH 97.02148	S-119-C-BG, 3RD 5 CM	0.34 ± 0.06	0.37 ± 0.34	0.394 ± 0.035	0.63 ± 0.21	0.128 ± 0.021	ND	ND	0.042	0.031 ± 0.016	13.20 ± 0.48
STUDY SAMPLES - FOURTH DEPTH											
SDH 97.02137	S-021-C, BOTTOM 10.5 CM	0.41 ± 0.05	0.50 ± 0.30	0.519 ± 0.033	0.56 ± 0.23	0.160 ± 0.018	0.28 ± 0.13	ND	0.029	0.057 ± 0.012	14.00 ± 0.43
SDH 97.02141	S-076-C, BOTTOM 12 CM	0.64 ± 0.06	0.67 ± 0.39	0.637 ± 0.040	0.87 ± 0.21	0.224 ± 0.023	ND	ND	0.043	0.106 ± 0.017	16.40 ± 0.53
SDH 97.02145	S-058-C, BOTTOM 9 CM	0.52 ± 0.05	0.35 ± 0.37	0.467 ± 0.035	0.56 ± 0.27	0.153 ± 0.022	ND	ND	0.040	0.095 ± 0.016	14.90 ± 0.48
SDH 97.02153	S-054-C, BOTTOM 12 CM	0.81 ± 0.06	0.75 ± 0.38	0.751 ± 0.040	0.69 ± 0.22	0.270 ± 0.023	ND	ND	0.043	0.112 ± 0.018	15.60 ± 0.54
SDH 97.02157	S-048-C, BOTTOM 12 CM	0.93 ± 0.08	1.00 ± 0.47	0.878 ± 0.048	1.06 ± 0.26	0.267 ± 0.027	ND	ND	0.052	0.142 ± 0.021	16.40 ± 0.58
SDH 97.02167	S-025-C, 4TH 5 CM	0.54 ± 0.08	ND	0.561 ± 0.051	ND	0.185 ± 0.032	ND	ND	0.060	0.081 ± 0.019	16.20 ± 0.66
SDH 97.02175	S-111-C, BOTTOM 10 CM	0.48 ± 0.07	0.46 ± 0.54	0.518 ± 0.043	0.61 ± 0.22	0.154 ± 0.026	ND	ND	0.049	0.114 ± 0.020	16.00 ± 0.59

TABLE A.17.d - *Continued*

		Activity (pCi / g-dry weight ± 2σ counting error)									
NAREL Sample ID	Field Sample Number	^{228}Ra	^{224}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDA	^{137}Cs	^{40}K
BACKGROUND SAMPLES - FOURTH DEPTH											
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	0.16 ± 0.03	ND	0.168 ± 0.020	0.25 ± 0.11	0.059 ± 0.012	ND	ND	0.026	ND	15.60 ± 0.36
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	0.44 ± 0.05	0.35 ± 0.33	0.452 ± 0.027	0.49 ± 0.20	0.143 ± 0.019	ND	ND	0.038	0.027 ± 0.013	13.10 ± 0.53
STUDY SAMPLES - FIFTH DEPTH											
SDH 97.02168	S-025-C, BOTTOM 15.5 CM	0.67 ± 0.04	0.62 ± 0.31	0.715 ± 0.030	0.57 ± 0.15	0.222 ± 0.017	ND	0.022 ± 0.012	NC	0.097 ± 0.014	17.10 ± 0.41

ND = Radionuclide was not detected by gamma spectrometry.
NC = Not calculated. The MDC is not calculated when the radionuclide is detected and quantified by the gamma spectrometry software.

TABLE A.18.a
Gross Alpha and Gross Beta Results for Core Sediment Samples taken in San Diego Harbor Displayed by Core

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.02134	S-021-C, TOP 5 CM	12.1 ± 6.8	18.8 ± 3.8
SDH 97.02135	S-021-C, 2ND 5 CM	8.0 ± 5.6	16.8 ± 3.5
SDH 97.02136	S-021-C, 3RD 5 CM	9.2 ± 5.8	18.2 ± 3.5
SDH 97.02137	S-021-C, BOTTOM 10.5 CM	6.1 ± 5.1	20.7 ± 3.7
SDH 97.02125	S-021-C-DUP, TOP 5CM	10.3 ± 6.0	18.9 ± 3.6
SDH 97.02126	S-021-C-DUP, 2ND 5 CM	1.0 ± 3.4	14.3 ± 3.3
SDH 97.02127	S-021-C-DUP, BOTTOM 8.5 CM	1.3 ± 3.9	16.0 ± 3.5
SDH 97.02138	S-076-C, TOP 5 CM	7.2 ± 5.9	25.7 ± 4.0
SDH 97.02139	S-076-C, 2ND 5 CM	11.6 ± 6.3	19.9 ± 3.7
SDH 97.02140	S-076-C, 3RD 5 CM	7.6 ± 5.7	19.1 ± 3.7
SDH 97.02141	S-076-C, BOTTOM 12 CM	9.2 ± 5.8	22.9 ± 3.8
SDH 97.02142	S058-C, TOP 5 CM	11.7 ± 6.4	22.8 ± 3.8
SDH 97.02143	S058-C, 2ND 5 CM	11.6 ± 6.4	20.3 ± 3.7
SDH 97.02144	S058-C, 3RD 5 CM	7.0 ± 5.5	19.4 ± 3.8
SDH 97.02145	S058-C, BOTTOM 9 CM	6.8 ± 5.3	17.1 ± 3.6
SDH 97.02150	S054-C, TOP 5 CM	14.8 ± 7.4	22.4 ± 4.0
SDH 97.02151	S054-C, 2ND 5 CM	9.7 ± 6.0	22.4 ± 3.8
SDH 97.02152	S054-C, 3RD 5 CM	11.7 ± 7.7	19.2 ± 3.8
SDH 97.02153	S054-C, BOTTOM 12 CM	8.6 ± 5.7	23.5 ± 3.9
SDH 97.02154	S048-C, TOP 5 CM	14.5 ± 8.0	18.2 ± 3.8
SDH 97.02155	S048-C, 2ND 5 CM	8.0 ± 5.6	17.0 ± 3.5
SDH 97.02156	S048-C, 3RD 5 CM	8.0 ± 5.3	20.6 ± 3.7
SDH 97.02157	S048-C, BOTTOM 12 CM	7.8 ± 5.5	16.8 ± 3.5
SDH 97.02158	S063-C, TOP 5 CM	15.4 ± 7.1	22.7 ± 4.0
SDH 97.02159	S063-C, 2ND 5 CM	13.5 ± 6.4	23.2 ± 3.8
SDH 97.02160	S-063-C, BOTTOM 8 CM	11.6 ± 6.4	24.6 ± 4.0
SDH 97.02164	S-025-C, TOP 5 CM	18.8 ± 8.8	20.8 ± 3.9
SDH 97.02165	S-025-C, 2ND 5 CM	5.6 ± 4.4	22.9 ± 3.7

TABLE A.18.a - *Continued*

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.02166	S-025-C, 3RD 5 CM	4.8 ± 4.5	24.2 ± 3.8
SDH 97.02167	S-025-C, 4TH 5 CM	21.5 ± 8.4	18.5 ± 3.7
SDH 97.02168	S-025-C, BOTTOM 15.5 CM	18.2 ± 8.1	21.0 ± 3.9
SDH 97.02161	S-025-C-DUP, TOP 5 CM	10.1 ± 5.7	17.9 ± 3.6
SDH 97.02162	S-025-C-DUP, 2ND 5 CM	7.8 ± 5.2	22.5 ± 3.9
SDH 97.02163	S-025-C-DUP, BOTTOM 8 CM	16.1 ± 7.2	20.1 ± 3.8
SDH 97.02169	S-027-C, TOP 5 CM	18.3 ± 7.8	23.3 ± 3.9
SDH 97.02170	S-027-C, 2ND 5 CM	12.1 ± 6.2	23.0 ± 3.8
SDH 97.02171	S-027-C, BOTTOM 8 CM	6.9 ± 5.6	20.1 ± 3.6
SDH 97.02172	S-111-C, TOP 5 CM	11.1 ± 5.8	23.1 ± 3.8
SDH 97.02173	S-111-C, 2ND 5 CM	19.1 ± 8.1	24.9 ± 4.1
SDH 97.02174	S-111-C, 3RD 5 CM	14.2 ± 6.9	20.2 ± 3.8
SDH 97.02175	S-111-C, BOTTOM 10 CM	14.9 ± 8.3	20.9 ± 3.9
SDH 97.02176	S-082-C, TOP 5 CM	13.3 ± 6.3	24.5 ± 3.9
SDH 97.02177	S-082-C, BOTTOM 5 CM	7.9 ± 5.2	23.3 ± 3.7
BACKGROUND SAMPLES			
SDH 97.02128	S-120-C-BG, TOP 5 CM	1.7 ± 3.8	16.0 ± 3.5
SDH 97.02129	S-120-C-BG, 2ND 5 CM	1.0 ± 3.4	17.8 ± 3.5
SDH 97.02130	S-120-C-BG, 3RD 5 CM	1.5 ± 3.4	18.4 ± 3.5
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	1.9 ± 3.8	16.3 ± 3.5
SDH 97.02132	S-121-C-BG, TOP 5 CM	6.8 ± 5.0	18.1 ± 3.5
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	3.9 ± 4.2	18.3 ± 3.5
SDH 97.02146	S-119-C-BG, TOP 5 CM	6.7 ± 4.9	17.9 ± 3.5
SDH 97.02147	S-119-C-BG, 2ND CM	3.6 ± 4.3	14.3 ± 3.4
SDH 97.02148	S-119-C-BG, 3RD 5 CM	7.0 ± 5.6	16.7 ± 3.5
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	8.1 ± 5.5	12.7 ± 3.2

TABLE A.18.b
Gross Alpha and Gross Beta Results for Core Sediment Samples taken in San Diego Harbor Displayed by Depth

		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.02134	S-021-C, TOP 5 CM	12.1 ± 6.8	18.8 ± 3.8
SDH 97.02125	S-021-C-DUP, TOP 5CM	10.3 ± 6.0	18.9 ± 3.6
SDH 97.02138	S-076-C, TOP 5 CM	7.2 ± 5.9	25.7 ± 4.0
SDH 97.02142	S-058-C, TOP 5 CM	11.7 ± 6.4	22.8 ± 3.8
SDH 97.02150	S-054-C, TOP 5 CM	14.8 ± 7.4	22.4 ± 4.0
SDH 97.02154	S-048-C, TOP 5 CM	14.5 ± 8.0	18.2 ± 3.8
SDH 97.02158	S-063-C, TOP 5 CM	15.4 ± 7.1	22.7 ± 4.0
SDH 97.02164	S-025-C, TOP 5 CM	18.8 ± 8.8	20.8 ± 3.9
SDH 97.02161	S-025-C-DUP, TOP 5 CM	10.1 ± 5.7	17.9 ± 3.6
SDH 97.02169	S-027-C, TOP 5 CM	18.3 ± 7.8	23.3 ± 3.9
SDH 97.02172	S-111-C, TOP 5 CM	11.1 ± 5.8	23.1 ± 3.8
SDH 97.02176	S-082-C, TOP 5 CM	13.3 ± 6.3	24.5 ± 3.9
SDH 97.02128	S-120-C-BG, TOP 5 CM	1.7 ± 3.8	16.0 ± 3.5
SDH 97.02132	S-121-C-BG, TOP 5 CM	6.8 ± 5.0	18.1 ± 3.5
SDH 97.02146	S-119-C-BG, TOP 5 CM	6.7 ± 4.9	17.9 ± 3.5
SDH 97.02135	S-021-C, 2ND 5 CM	8.0 ± 5.6	16.8 ± 3.5
SDH 97.02126	S-021-C-DUP, 2ND 5 CM	1.0 ± 3.4	14.3 ± 3.3
SDH 97.02139	S-076-C, 2ND 5 CM	11.6 ± 6.3	19.9 ± 3.7
SDH 97.02143	S-058-C, 2ND 5 CM	11.6 ± 6.4	20.3 ± 3.7
SDH 97.02151	S-054-C, 2ND 5 CM	9.7 ± 6.0	22.4 ± 3.8
SDH 97.02155	S-048-C, 2ND 5 CM	8.0 ± 5.6	17.0 ± 3.5
SDH 97.02159	S-063-C, 2ND 5 CM	13.5 ± 6.4	23.2 ± 3.8
SDH 97.02165	S-025-C, 2ND 5 CM	5.6 ± 4.4	22.9 ± 3.7
SDH 97.02162	S-025-C-DUP, 2ND 5 CM	7.8 ± 5.2	22.5 ± 3.9
SDH 97.02170	S-027-C, 2ND 5 CM	12.1 ± 6.2	23.0 ± 3.8
SDH 97.02173	S-111-C, 2ND 5 CM	19.1 ± 8.1	24.9 ± 4.1
SDH 97.02177	S-082-C, BOTTOM 5 CM	7.9 ± 5.2	23.3 ± 3.7

TABLE A.18.b
Gross Alpha and Gross Beta Results for Core Sediment Samples taken in San Diego Harbor Displayed by Depth

		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.02129	S-120-C-BG, 2ND 5 CM	1.0 ± 3.4	17.8 ± 3.5
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	3.9 ± 4.2	18.3 ± 3.5
SDH 97.02147	S-119-C-BG, 2ND CM	3.6 ± 4.3	14.3 ± 3.4
SDH 97.02136	S-021-C, 3RD 5 CM	9.2 ± 5.8	18.2 ± 3.5
SDH 97.02127	S-021-C-DUP, BOTTOM 8.5 CM	1.3 ± 3.9	16.0 ± 3.5
SDH 97.02140	S-076-C, 3RD 5 CM	7.6 ± 5.7	19.1 ± 3.7
SDH 97.02144	S-058-C, 3RD 5 CM	7.0 ± 5.5	19.4 ± 3.8
SDH 97.02152	S-054-C, 3RD 5 CM	11.7 ± 7.7	19.2 ± 3.8
SDH 97.02156	S-048-C, 3RD 5 CM	8.0 ± 5.3	20.6 ± 3.7
SDH 97.02160	S-063-C, BOTTOM 8 CM	11.6 ± 6.4	24.6 ± 4.0
SDH 97.02166	S-025-C, 3RD 5 CM	4.8 ± 4.5	24.2 ± 3.8
SDH 97.02163	S-025-C-DUP, BOTTOM 8 CM	16.1 ± 7.2	20.1 ± 3.8
SDH 97.02171	S-027-C, BOTTOM 8 CM	6.9 ± 5.6	20.1 ± 3.6
SDH 97.02174	S-111-C, 3RD 5 CM	14.2 ± 6.9	20.2 ± 3.8
SDH 97.02130	S-120-C-BG, 3RD 5 CM	1.5 ± 3.4	18.4 ± 3.5
SDH 97.02148	S-119-C-BG, 3RD 5 CM	7.0 ± 5.6	16.7 ± 3.5
SDH 97.02137	S-021-C, BOTTOM 10.5 CM	6.1 ± 5.1	20.7 ± 3.7
SDH 97.02141	S-076-C, BOTTOM 12 CM	9.2 ± 5.8	22.9 ± 3.8
SDH 97.02145	S058-C, BOTTOM 9 CM	6.8 ± 5.3	17.1 ± 3.6
SDH 97.02153	S-054-C, BOTTOM 12 CM	8.6 ± 5.7	23.5 ± 3.9
SDH 97.02157	S-048-C, BOTTOM 12 CM	7.8 ± 5.5	16.8 ± 3.5
SDH 97.02167	S-025-C, 4TH 5 CM	21.5 ± 8.4	18.5 ± 3.7
SDH 97.02175	S-111-C, BOTTOM 10 CM	14.9 ± 8.3	20.9 ± 3.9
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	1.9 ± 3.8	16.3 ± 3.5
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	8.1 ± 5.5	12.7 ± 3.2
SDH 97.02168	S-025-C, BOTTOM 15.5 CM	18.2 ± 8.1	21.0 ± 3.9

TABLE A.19
Radium-226 Results for Core Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)
NAREL Sample ID	Field Sample Number	^{226}Ra
97.02134M	S-021-C, TOP 5 CM	0.474 ± 0.035
97.02138R	S-076-C, TOP 5 CM	0.590 ± 0.042
97.02153Q	S-054-C, BOTTOM 12 CM	0.469 ± 0.038
97.02158W	S-063-C, TOP 5 CM	0.563 ± 0.040
97.02167X	S-025-C, 4TH 5 CM	0.466 ± 0.037
97.02173V	S-111-C, 2ND CM	0.700 ± 0.039
BACKGROUND SAMPLES		
97.02128P	S-120-C-BG, TOP 5 CM	0.257 ± 0.029
97.02129Q	S-120-C-BG, 2ND 5 CM	0.283 ± 0.031
97.02130H	S-120-C-BG, 3RD 5 CM	0.275 ± 0.032
97.02131J	S-120-C-BG, BOTTOM 12 CM	0.266 ± 0.031
97.02132K	S-121-C-BG, TOP 5 CM	0.365 ± 0.035
97.02133L	S-121-C-BG, BOTTOM 4 CM	0.660 ± 0.047
97.02146R	S-119-C-BG, TOP 5 CM	0.481 ± 0.039
97.02147T	S-119-C-BG, 2ND CM	0.422 ± 0.035
97.02148U	S-119-C-BG, 3RD 5 CM	0.433 ± 0.037
97.02149V	S-119-C-BG, BOTTOM 11 CM	0.476 ± 0.039

Note: Core sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for radium-226 content. None of the study core sediment samples contained the highest gross alpha or gross beta concentrations. Therefore, radium-226 analysis was not conducted for study core sediment samples. All background samples were analyzed for radium-226.

TABLE A.20
Uranium Results for Core Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight + 2σ counting error)		
NAREL Sample ID	Field Sample Number	^{234}U	^{235}U	^{238}U
SDH 97.02134	S-021-C, TOP 5 CM	0.54 ± 0.09	0.033 ± 0.022	0.413 ± 0.075
SDH 97.02138	S-076-C, TOP 5 CM	0.74 ± 0.10	0.051 ± 0.025	0.636 ± 0.090
SDH 97.02153	S-054-C, BOTTOM 12 CM	0.82 ± 0.15	0.034 ± 0.037	0.717 ± 0.143
SDH 97.02158	S-063-C, TOP 5 CM	0.49 ± 0.09	0.019 ± 0.022	0.646 ± 0.110
SDH 97.02167	S-025-C, 4TH 5 CM	0.46 ± 0.11	0.018 ± 0.024	0.493 ± 0.112
SDH 97.02173	S-111-C, 2ND 5 CM	0.61 ± 0.10	0.106 ± 0.045	0.625 ± 0.106
BACKGROUND SAMPLES				
SDH 97.02128	S-120-C-BG, TOP 5 CM	0.36 ± 0.08	0.046 ± 0.031	0.372 ± 0.080
SDH 97.02129	S-120-C-BG, 2ND 5 CM	0.27 ± 0.08	0.025 ± 0.027	0.269 ± 0.076
SDH 97.02130	S-120-C-BG, 3RD 5 CM	0.29 ± 0.08	0.042 ± 0.037	0.219 ± 0.069
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	0.28 ± 0.09	0.038 ± 0.042	0.165 ± 0.068
SDH 97.02132	S-121-C-BG, TOP 5 CM	0.28 ± 0.08	0.020 ± 0.032	0.229 ± 0.078
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	0.73 ± 0.12	0.052 ± 0.034	0.592 ± 0.110
SDH 97.02146	S-119-C-BG, TOP 5 CM	0.46 ± 0.10	0.047 ± 0.034	0.422 ± 0.094
SDH 97.02147	S-119-C-BG, 2ND CM	0.39 ± 0.07	0.030 ± 0.021	0.341 ± 0.069
SDH 97.02148	S-119-C-BG, 3RD 5 CM	0.41 ± 0.08	0.029 ± 0.022	0.361 ± 0.071
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	0.38 ± 0.08	0.034 ± 0.024	0.450 ± 0.084

Note: Core sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for uranium content. None of the study core sediment samples contained the highest gross alpha or gross beta concentrations. Therefore, uranium analysis was not conducted for study core sediment samples. All background samples were analyzed for uranium.

TABLE A.21
Thorium Results for Core Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)			
NAREL Sample ID	Field Sample Number	^{227}Th	^{228}Th	^{230}Th	^{232}Th
SDH 97.02134	S-021-C, TOP 5 CM	0.025 ± 0.027	0.345 ± 0.074	0.531 ± 0.091	0.451 ± 0.083
SDH 97.02138	S-076-C, TOP 5 CM	0.050 ± 0.058	0.509 ± 0.128	0.824 ± 0.154	0.896 ± 0.161
SDH 97.02153	S-054-C, BOTTOM 12 CM	0.027 ± 0.027	0.679 ± 0.098	0.752 ± 0.102	1.047 ± 0.123
SDH 97.02158	S-063-C, TOP 5 CM	0.032 ± 0.031	0.485 ± 0.088	0.562 ± 0.095	0.607 ± 0.099
SDH 97.02167	S-025-C, 4TH 5 CM	0.022 ± 0.040	0.517 ± 0.105	0.483 ± 0.096	0.640 ± 0.110
SDH 97.02173	S-111-C, 2ND 5 CM	0.027 ± 0.034	0.580 ± 0.099	0.664 ± 0.106	0.663 ± 0.106
BACKGROUND SAMPLES					
SDH 97.02128	S-120-C-BG, TOP 5 CM	-0.004 ± 0.008	0.174 ± 0.071	0.222 ± 0.078	0.145 ± 0.062
SDH 97.02129	S-120-C-BG, 2ND 5 CM	0.031 ± 0.040	0.184 ± 0.069	0.193 ± 0.061	0.214 ± 0.064
SDH 97.02130	S-120-C-BG, 3RD 5 CM	-0.011 ± 0.011	0.167 ± 0.057	0.147 ± 0.052	0.175 ± 0.056
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	0.025 ± 0.031	0.119 ± 0.048	0.164 ± 0.053	0.145 ± 0.050
SDH 97.02132	S-121-C-BG, TOP 5 CM	0.041 ± 0.038	0.624 ± 0.105	0.536 ± 0.097	0.678 ± 0.110
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	0.051 ± 0.051	0.465 ± 0.110	0.300 ± 0.083	0.614 ± 0.120
SDH 97.02146	S-119-C-BG, TOP 5 CM	0.003 ± 0.027	0.319 ± 0.081	0.410 ± 0.089	0.436 ± 0.092
SDH 97.02147	S-119-C-BG, 2ND CM	0.024 ± 0.029	0.342 ± 0.077	0.406 ± 0.081	0.456 ± 0.086
SDH 97.02148	S-119-C-BG, 3RD 5 CM	0.062 ± 0.044	0.429 ± 0.088	0.502 ± 0.095	0.510 ± 0.095
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	0.025 ± 0.026	0.359 ± 0.069	0.394 ± 0.071	0.432 ± 0.075

Note: Core sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for thorium content. None of the study core sediment samples contained the highest gross alpha or gross beta concentrations. Therefore, thorium analysis was not conducted for study core sediment samples. All background samples were analyzed for thorium.

TABLE A.22
Plutonium Results for Core Sediment Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-dry weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	^{238}Pu	$^{239/240}Pu$
SDH 97.02134	S-021-C, TOP 5 CM	0.001 ± 0.015	0.004 ± 0.008
SDH 97.02138	S-076-C, TOP 5 CM	0.006 ± 0.016	0.001 ± 0.006
SDH 97.02153	S-054-C, BOTTOM 12 CM	0.013 ± 0.026	0.009 ± 0.013
SDH 97.02158	S-063-C, TOP 5 CM	0.022 ± 0.029	0.005 ± 0.012
SDH 97.02167	S-025-C, 4TH 5 CM	0.032 ± 0.034	0.008 ± 0.015
SDH 97.02173	S-111-C, 2ND 5 CM	0.002 ± 0.015	0.007 ± 0.009
BACKGROUND SAMPLES			
SDH 97.02128	S-120-C-BG, TOP 5 CM	-0.023 ± 0.027	-0.007 ± 0.012
SDH 97.02129	S-120-C-BG, 2ND 5 CM	0.018 ± 0.035	0.012 ± 0.017
SDH 97.02130	S-120-C-BG, 3RD 5 CM	-0.004 ± 0.009	0.003 ± 0.007
SDH 97.02131	S-120-C-BG, BOTTOM 12 CM	0.014 ± 0.018	0.006 ± 0.009
SDH 97.02132	S-121-C-BG, TOP 5 CM	0.003 ± 0.018	0.002 ± 0.003
SDH 97.02133	S-121-C-BG, BOTTOM 4 CM	0.000 ± 0.017	0.002 ± 0.003
SDH 97.02146	S-119-C-BG, TOP 5 CM	0.003 ± 0.037	0.014 ± 0.018
SDH 97.02147	S-119-C-BG, 2ND CM	0.014 ± 0.018	0.005 ± 0.009
SDH 97.02148	S-119-C-BG, 3RD 5 CM	0.005 ± 0.035	0.005 ± 0.010
SDH 97.02149	S-119-C-BG, BOTTOM 11 CM	0.008 ± 0.016	0.002 ± 0.006

Note: Core sediment samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for plutonium content. None of the study core sediment samples contained the highest gross alpha or gross beta concentrations. Therefore, plutonium analysis was not conducted for study core sediment samples. All background samples were analyzed for plutonium.

TABLE A.23.a
Gamma Spectrometry Results for Biota Samples taken in San Diego Harbor
Uranium and Actinium Chain Gamma Emitting Radionuclides

STUDY SAMPLES		Activity (pCi / g-wet ± 2σ counting error)					
NAREL Sample ID	Field Sample Number	^{234}Th	^{134m}Pa	^{226}Ra	^{214}Pb	^{214}Bi	^{235}U
SDH 97.01948	S-025-BSF	0.092 ± 0.047	ND	0.094 ± 0.056	ND	ND	ND
SDH 97.01949	S-025-BSF-DUP	0.121 ± 0.045	ND	0.141 ± 0.054	ND	ND	0.0088 ± 0.0032
SDH 97.01950	S-063-BSF	ND	ND	0.061 ± 0.048	ND	ND	ND
SDH 97.01951	S-063-BBK	0.147 ± 0.107	ND	ND	ND	ND	ND
SDH 97.01952	S-063-BC	ND	ND	ND	0.0125 ± 0.0060	0.0113 ± 0.0066	ND
SDH 97.02117	S-021-BSC	0.247 ± 0.057	0.45 ± 0.19	0.072 ± 0.049	0.0191 ± 0.0040	0.0184 ± 0.0036	ND
SDH 97.02116	S-021-BSC-DUP	ND	0.35 ± 0.20	0.048 ± 0.051	0.0151 ± 0.0040	0.0181 ± 0.0034	ND
SDH 97.02123	S-082-BC	ND	ND	ND	0.0151 ± 0.0037	0.0117 ± 0.0040	ND
SDH 97.02178	S-111-BSC	0.316 ± 0.057	0.27 ± 0.18	0.069 ± 0.062	0.0278 ± 0.0045	0.0266 ± 0.0039	ND
SDH 97.02179	S-082-BSF	ND	ND	0.064 ± 0.050	ND	ND	ND
BACKGROUND SAMPLES							
SDH 97.02118	S-120-BSF-BG	ND	ND	0.118 ± 0.060	ND	ND	ND
SDH 97.02119	S-121-BBK-BG	ND	ND	ND	ND	ND	ND
SDH 97.02120	S-121-BBPS-BG	ND	ND	ND	ND	ND	ND
SDH 97.02121	S-120-BBK-BG	ND	ND	ND	ND	ND	ND
SDH 97.02122	S-119-BSP-BG	0.056 ± 0.054	ND	0.052 ± 0.075	ND	0.0143 ± 0.0067	ND

ND = Radionuclide was not detected by gamma spectrometry.

TABLE A.23.b
Gamma Spectrometry Results for Biota Samples taken in San Diego Harbor
Thorium Chain and other Gamma Emitting Radionuclides

STUDY SAMPLES		Activity (pCi / g-wet ± 2σ counting error)								
NAREL Sample ID	Field Sample Number	^{228}Ra	^{212}Pb	^{212}Bi	^{208}Tl	^{7}Be	^{60}Co	^{60}Co MDA	^{137}Cs	^{40}K
SDH 97.01948	S-025-BSF	ND	ND	ND	ND	ND	ND	0.0055	ND	1.720 ± 0.068
SDH 97.01949	S-025-BSF-DUP	ND	0.0041 ± 0.0040	ND	ND	ND	ND	0.0057	ND	1.470 ± 0.063
SDH 97.01950	S-063-BSF	ND	ND	ND	ND	ND	ND	0.0038	ND	2.160 ± 0.058
SDH 97.01951	S-063-BBK	ND	ND	ND	0.0076 ± 0.0090	ND	ND	0.0296	ND	14.20 ± 0.427
SDH 97.01952	S-063-BC	0.0271 ± 0.0076	0.0166 ± 0.0049	0.035 ± 0.031	0.0064 ± 0.0033	ND	ND	0.0067	ND	1.700 ± 0.075
SDH 97.02117	S-021-BSC	ND	0.0303 ± 0.0058	ND	0.0074 ± 0.0022	0.028 ± 0.022	ND	0.0037	0.005 ± 0.002	1.190 ± 0.047
SDH 97.02116	S-021-BSC-DUP	ND	0.0196 ± 0.0043	ND	0.0058 ± 0.0021	0.048 ± 0.024	ND	0.0043	0.002 ± 0.001	1.020 ± 0.043
SDH 97.02123	S-082-BC	ND	0.0119 ± 0.0050	ND	0.0031 ± 0.0020	ND	ND	0.0042	ND	1.790 ± 0.056
SDH 97.02178	S-111-BSC	ND	0.0337 ± 0.0060	0.039 ± 0.020	0.0098 ± 0.0021	0.039 ± 0.024	ND	0.0036	0.006 ± 0.002	1.330 ± 0.049
SDH 97.02179	S-082-BSF	ND	ND	ND	ND	ND	ND	0.0037	ND	2.130 ± 0.056
BACKGROUND SAMPLES										
SDH 97.02118	S-120-BSF-BG	ND	ND	ND	ND	ND	ND	0.0054	ND	1.160 ± 0.060
SDH 97.02119	S-121-BBK-BG	ND	0.0089 ± 0.0100	ND	ND	ND	ND	0.0134	ND	12.70 ± 0.226
SDH 97.02120	S-121-BBPS-BG	ND	ND	ND	ND	ND	ND	0.0145	ND	13.80 ± 0.204
SDH 97.02121	S-120-BBK-BG	ND	ND	ND	ND	ND	ND	0.0143	ND	12.60 ± 0.229
SDH 97.02122	S-119-BSP-BG	0.0255 ± 0.0079	0.0349 ± 0.0066	0.080 ± 0.034	0.0119 ± 0.0038	ND	ND	0.0066	0.003 ± 0.002	1.840 ± 0.077

ND = Radionuclide was not detected by gamma spectrometry.

TABLE A.24
Gross Alpha and Gross Beta Results for Biota Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-wet weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	Gross Alpha	Gross Beta
SDH 97.01948	S-025-BSF	0.87 ± 0.55	1.69 ± 0.34
SDH 97.01949	S-025-BSF-DUP	1.29 ± 0.72	0.94 ± 0.36
SDH 97.01950	S-063-BSF	1.66 ± 0.81	1.76 ± 0.39
SDH 97.01951	S-063-BBK	0.08 ± 0.20	15.11 ± 0.60
SDH 97.01952	S-063-BC	0.24 ± 0.82	2.63 ± 0.69
SDH 97.02117	S-021-BSC	0.22 ± 0.18	0.91 ± 0.14
SDH 97.02116	S-021-BSC-DUP	0.20 ± 0.16	0.91 ± 0.13
SDH 97.02123	S-082-BC	1.16 ± 0.89	2.55 ± 0.55
SDH 97.02178	S-111-BSC	0.24 ± 0.18	0.93 ± 0.14
SDH 97.02179	S-082-BSF	1.99 ± 0.75	3.13 ± 0.41
BACKGROUND SAMPLES			
SDH 97.02118	S-120-BSF-BG	0.76 ± 0.63	1.98 ± 0.43
SDH 97.02119	S-121-BBK-BG	0.20 ± 0.21	11.89 ± 0.54
SDH 97.02120	S-121-BBPS-BG	0.24 ± 0.22	13.44 ± 0.51
SDH 97.02121	S-120-BBK-BG	0.19 ± 0.22	12.93 ± 0.54
SDH 97.02122	S-119-BSP-BG	1.70 ± 0.94	2.70 ± 0.53

TABLE A.25
Radium-226 Results for Biota Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-wet weight ± 2-σ counting error)
NAREL Sample ID	Field Sample Number	^{226}Ra
97.01950J	S-063-BSF	0.0154 ± 0.0028
BACKGROUND SAMPLES		
97.02118M	S-120-BSF-BG	0.0220 ± 0.0034
97.02119N	S-121-BBK-BG	0.0162 ± 0.0017
97.02120F	S-121-BBPS-BG	0.0087 ± 0.0012
97.02121G	S-120-BBK-BG	0.0157 ± 0.0015
97.02122H	S-119-BSP-BG	0.0572 ± 0.0050

Note: Biota samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for radium-226 content. None of the study biota samples contained the highest gross alpha or gross beta concentrations. Therefore, radium-226 analysis was not conducted for study biota samples. All background samples were analyzed for radium-226.

TABLE A.26
Uranium Results for Biota Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-wet weight ± 2σ counting error)		
NAREL Sample ID	Field Sample Number	^{234}U	^{235}U	^{238}U
SDH 97.01950	S-063-BSF	0.109 ± 0.016	0.0069 ± 0.0042	0.098 ± 0.015
BACKGROUND SAMPLES				
SDH 97.02118	S-120-BSF-BG	0.161 ± 0.022	0.0053 ± 0.0040	0.140 ± 0.020
SDH 97.02119	S-121-BBK-BG	0.017 ± 0.004	0.0026 ± 0.0017	0.017 ± 0.004
SDH 97.02120	S-121-BBPS-BG	0.014 ± 0.004	0.0015 ± 0.0013	0.014 ± 0.004
SDH 97.02121	S-120-BBK-BG	0.017 ± 0.004	0.0010 ± 0.0012	0.014 ± 0.004
SDH 97.02122	S-119-BSP-BG	0.060 ± 0.013	0.0008 ± 0.0023	0.050 ± 0.012

Note: Biota samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for uranium content. None of the study biota samples contained the highest gross alpha or gross beta concentrations. Therefore, uranium analysis was not conducted for study biota samples. All background samples were analyzed for uranium.

TABLE A.27
Thorium Results for Biota Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-wet weight ± 2σ counting error)			
NAREL Sample ID	Field Sample Number	^{227}Th	^{228}Th	^{230}Th	^{232}Th
SDH 97.01950	S-063-BSF	-0.0002 ± 0.0024	-0.0016 ± 0.0048	0.0041 ± 0.0028	0.0016 ± 0.0018
BACKGROUND SAMPLES					
SDH 97.02118	S-120-BSF-BG	0.0017 ± 0.0037	0.0011 ± 0.0055	0.0030 ± 0.0027	0.0003 ± 0.0018
SDH 97.02119	S-121-BBK-BG	0.0004 ± 0.0012	0.0022 ± 0.0025	0.0032 ± 0.0016	0.0026 ± 0.0016
SDH 97.02120	S-121-BBPS-BG	0.0001 ± 0.0005	-0.0010 ± 0.0012	0.0007 ± 0.0006	0.0015 ± 0.0008
SDH 97.02121	S-120-BBK-BG	0.0006 ± 0.0009	-0.0003 ± 0.0015	0.0012 ± 0.0008	0.0000 ± 0.0000
SDH 97.02122	S-119-BSP-BG	0.0028 ± 0.0036	0.0436 ± 0.0100	0.0445 ± 0.0087	0.0651 ± 0.0106

Note: Biota samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for thorium content. None of the study biota samples contained the highest gross alpha or gross beta concentrations. Therefore, thorium analysis was not conducted for study biota samples. All background samples were analyzed for thorium.

TABLE A.28
Plutonium Results for Biota Samples taken in San Diego Harbor

STUDY SAMPLES		Activity (pCi / g-wet weight ± 2σ counting error)	
NAREL Sample ID	Field Sample Number	^{238}Pu	$^{239/240}Pu$
SDH 97.01950	S-063-BSF	-0.00030 ± 0.00152	0.00015 ± 0.00099
BACKGROUND SAMPLES			
SDH 97.02118	S-120-BSF-BG	-0.00018 ± 0.00189	0.00077 ± 0.00172
SDH 97.02119	S-121-BBK-BG	0.00048 ± 0.00088	0.00036 ± 0.00076
SDH 97.02120	S-121-BBPS-BG	0.00006 ± 0.00061	-0.00013 ± 0.00018
SDH 97.02121	S-120-BBK-BG	-0.00087 ± 0.00139	0.00007 ± 0.00064
SDH 97.02122	S-119-BSP-BG	0.00226 ± 0.00398	-0.00035 ± 0.00130

Note: Biota samples were batched together as one matrix. Per the approved sampling plan, only a percentage of samples based on the highest gross alpha and gross beta concentrations were analyzed for plutonium content. None of the study biota samples contained the highest gross alpha or gross beta concentrations. Therefore, plutonium analysis was not conducted for study biota samples. All background samples were analyzed for plutonium.

TABLE A.29

External Gamma Radiation Measurements taken at San Diego Harbor using Various Radiation Detection Instruments

Field Location Number	Pressurized Ion Chamber (PIC) (uR/h)*	Genitron (uR/h)**	E-600 (cpm)
S128	9.5	10.8	2100
S130	6.7	10.3	1180
S131	9.4	10.4	1425
S132	7.7	10.9	1575
S134	7.0	11.2	1345
S135	6.5	8.0	1360
S136	6.9	7.7	1300
S137	6.7	8.2	1470
S139	6.6	8.0	1340
S140	7.7	9.7	1700
S147	4.7	N/A	N/A
S148	4.4	N/A	N/A
S149	4.8	N/A	N/A
BACKGROUND LOCATIONS			
S129	9.9	10.8	2750
S133	6.5	8.2	1100
S138	7.6	7.9	1685

* = Converted from mR/h
** = Converted from nS/h
N/A = Not applicable, no measurement was made with this instrument at this location.