REPORT NT-26-5
April 2026

U.S. NAVY REPORT OF ENVIRONMENTAL MONITORING IN SASEBO, YOKOSUKA, AND NAKAGUSUKU WAN, JAPAN FOR RADIOACTIVITY ASSOCIATED WITH NAVAL NUCLEAR PROPULSION PLANTS 2025

NAVAL NUCLEAR PROPULSION PROGRAM
DEPARTMENT OF THE NAVY
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U.S. NAVY REPORT OF ENVIRONMENTAL MONITORING IN SASEBO, YOKOSUKA, AND NAKAGUSUKU WAN, JAPAN FOR RADIOACTIVITY ASSOCIATED WITH NAVAL NUCLEAR PROPULSION PLANTS – 2025

INTRODUCTION

The policy of the U.S. Navy is to reduce to the minimum practicable the amounts of radioactivity released from naval nuclear-powered ships, particularly within twelve miles from shore and into harbors. Consistent with that policy, the total amount of gamma radioactivity released within all U.S. and foreign harbors visited by nuclear-powered ships in the U.S. Navy was collectively less than 74 MBq[1] (0.002 Ci[2]) in 2025. This amount of radioactivity is too small to have had any discernable effect on the radioactivity of any harbor environment. However, to provide additional assurance that procedures used by the U.S. Navy to control radioactivity are adequate to protect the environment, the Navy conducts periodic radiological environmental monitoring surveys. This report summarizes the results of environmental monitoring in the harbors of Sasebo and Yokosuka, and in Nakagusuku Wan on Okinawa Island.

The Navy environmental monitoring program consists of measuring radiation levels and analyzing samples of harbor water, sediment, and marine life. In support of the forward deployment of U.S. nuclear-powered aircraft carriers, more extensive radiation monitoring of U.S. Fleet Activities Yokosuka began in 2008. Sampling harbor water and sediment each quarter year is emphasized since these materials would be the most likely affected by releases of radioactivity. The environmental samples are analyzed by a laboratory of the U.S. Department of Energy for cobalt-60 and other gamma emitting radionuclides. These environmental media are analyzed since they are the ones that would most likely reveal any changes in radioactivity concentrations due to nuclear-powered ship operations. Cobalt-60 is specifically analyzed because it is a sensitive tracer used to follow environmental distribution of radioactivity and it is the predominant long-lived radionuclide associated with liquid effluents from U.S. naval nuclear-powered ship operations. Results of this monitoring show that radioactivity in the harbor environment has not increased above background levels as a result of operations by U.S. naval nuclear-powered ships (background levels include naturally-occurring radioactivity as well as fallout from the Fukushima Daiichi reactor accidents and worldwide dispersion from weapons testing). These results also confirm that procedures used by the Navy to control radioactivity are effective in protecting the environment and the health and safety of the general public.

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[1] One megabecquerel (1 MBq) equals 10^6 becquerels.
[2] One curie (1 Ci) equals 3.7×10^{10} becquerels.

RADIATION MONITORING

Ambient radiation levels are continuously measured using sensitive thermoluminescent dosimeters (TLDs). On-site TLDs, facility perimeter TLDs, and harbor perimeter TLDs are posted at the locations shown in Figure 1. The on-site TLDs are posted between where the nuclear-powered aircraft carrier is berthed and the facility perimeter. The facility perimeter TLDs are posted at the boundary of U.S. Fleet Activities Yokosuka and the City of Yokosuka, while the harbor perimeter TLDs are posted along the waterline of U.S. Fleet Activities Yokosuka. Control TLDs are posted off-site at the locations shown in Figure 2, between 6 and 32 kilometers from U.S. Fleet Activities Yokosuka. These control TLDs are posted to measure background radiation levels. All TLDs are posted and read quarterly.

All TLD results reported are in millisievert[1] (mSv) per calendar quarter. In 2025, on-site TLD results ranged from 0.11 mSv to 0.16 mSv, with an average of 0.13 mSv. Facility perimeter TLD results ranged from 0.11 mSv to 0.17 mSv, with an average of 0.13 mSv. Harbor perimeter TLD results ranged from 0.08 mSv to 0.17 mSv, with an average of 0.12 mSv. Control TLD results ranged from 0.09 mSv to 0.16 mSv, with an average of 0.12 mSv. As a result of radioactive fallout from the Fukushima Daiichi reactor accidents, measured radiation levels during the second quarter of 2011 for on-site, perimeter, and control TLDs were about 70% higher than historical averages. Radiation levels decreased rapidly due to the decay of iodine-131 and continued to decrease due to the decay of cesium-134 and cesium-137. In 2021, radiation levels returned to approximately the background levels from prior to 2011. The increased radiation levels were not associated with U.S. naval nuclear-powered ship operations. Comparison of perimeter and on-site TLD data with control TLD data demonstrates that radiation exposure to the general public near this facility is not distinguishable from that due to background radiation.

HARBOR WATER SAMPLES

Harbor water samples are taken once each quarter year in Sasebo, Yokosuka, and Nakagusuku Wan in areas where nuclear-powered ships berth and from upstream and downstream locations. A germanium detector with a multichannel analyzer is used to measure the gamma radioactivity of the samples and to detect the presence of cobalt-60. Procedures for analysis will detect cobalt-60 if its concentration exceeds the U.S. Environmental Protection Agency drinking water limits (3.7 becquerels per liter)[2], which is more than a factor of 25 lower than the drinking water standard set by the World Health Organization (100 becquerels per liter). No cobalt-60, cesium-137, or other non-naturally occurring radionuclides were detected in any of the quarterly water samples collected. The harbor water sample locations are shown in Figures 3, 4, and 5.

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[1] One millisievert equals 100 millirem.

[2] One becquerel per liter equals 2.7×10^{-8} microcurie per milliliter.

HARBOR SEDIMENT SAMPLES

Sediment samples are obtained once each quarter year in Sasebo, Yokosuka, and Nakagusuku Wan from select locations including U.S. nuclear-powered ship berthing locations and areas away from these berthing locations. This frequency is adequate to monitor nuclear-powered ship operations since the predominant associated radionuclide, cobalt-60, has a half-life slightly in excess of five years and will not appreciably decay between surveys. The harbor sediment sample locations are shown in Figures 3, 4, and 5. The samples are collected with a six inch square Birge-Ekman dredge (grapple type sampler) modified to collect only the top one-half to one inch of sediment. This layer was selected because it should be more mobile and more accessible to marine life than deeper layers. The dredge samples are analyzed for gamma radioactivity, including cobalt-60 and other non-naturally occurring radionuclides, using a germanium detector with a multichannel analyzer. The dredge samples are not dried prior to analysis, but are drained of excess water. Results from the dredge samples are summarized in Table 1. A range is shown since samples from different locations show some variation.

Results of these analyses show that the most predominant gamma emitting radionuclides are naturally occurring potassium-40 and progeny of uranium and thorium. All Sasebo, Yokosuka, and Nakagusuku Wan samples analyzed contained no detectable cobalt-60. Sediment samples taken from Yokosuka in 2025 contained cesium-137 as a result of radioactive fallout from the Fukushima Daiichi reactor accidents. Cesium-137 was also detected in some sediment samples from Sasebo at concentrations consistent with those found in many parts of the world due to worldwide dispersion from weapons testing. The radionuclides detected are not related to U.S. naval nuclear-powered ship operations because the high integrity naval fuel retains all related fission products.

TABLE 1
RESULTS OF HARBOR SEDIMENT SAMPLES

SASEBO HARBOR

Quarter	Number of Samples	Number of Samples with Detectable Co-60	Range of Co-60 Analytical Results (Bq/kg)	Range of Other Non-Naturally Occurring Radionuclides (Bq/kg)
1st	17	0	<0.44 – <1.74	Cs-137: 0.74 – 1.07
2nd	17	0	<0.41 – <1.81	None
3rd	17	0	<0.41 – <1.85	Cs-137: 1.04
4th	17	0	<0.37 – <1.81	Cs-137: 1.26 – 1.33

NAKAGUSUKU WAN

Quarter	Number of Samples	Number of Samples with Detectable Co-60	Range of Co-60 Analytical Results (Bq/kg)	Range of Other Non-Naturally Occurring Radionuclides (Bq/kg)
1st	15	0	<0.26 – <1.11	None
2nd	15	0	<0.31 – <1.07	None
3rd	15	0	<0.31 – <1.11	None
4th	15	0	<0.30 – <1.07	None

Notes:
(1) Results with a "<" symbol contained less than the minimum detectable concentration. The minimum detectable concentration may differ from sample to sample or quarter to quarter due to differences in the amount of naturally occurring radioactivity in each sample, differences in detection equipment, statistical fluctuations and variations in sample size.
(2) Values given as "<X – <Y" reflect the range of minimum detectable concentrations measured for individual samples.
(3) One becquerel per kilogram (Bq/kg) equals 0.027 picocurie per gram.

YOKOSUKA HARBOR

Quarter	Number of Samples	Number of Samples with Detectable Co-60	Range of Co-60 Analytical Results (Bq/kg)	Range of Other Non-Naturally Occurring Radionuclides (Bq/kg)
1st	23	0	<0.33 – <1.63	Cs-137: 1.19 – 2.30
2nd	23	0	<0.41 – <1.74	Cs-137: 0.59 – 2.52
3rd	23	0	<0.37 – <1.70	Cs-137: 1.33 – 2.74
4th	23	0	<0.44 – <2.00	Cs-137: 0.96 – 3.15

Notes:
(1) Results with a "<" symbol contained less than the minimum detectable concentration. The minimum detectable concentration may differ from sample to sample or quarter to quarter due to differences in the amount of naturally occurring radioactivity in each sample, differences in detection equipment, statistical fluctuations and variations in sample size.
(2) Values given as "<X – <Y" reflect the range of minimum detectable concentrations measured for individual samples.
(3) One becquerel per kilogram (Bq/kg) equals 0.027 picocurie per gram.

MARINE LIFE SAMPLES

An evaluation by the U.S. Environmental Protection Agency shows that the cobalt-60 from naval nuclear propulsion plants is in the form of metallic corrosion product particles which do not appear to concentrate in the food chain. However, samples of marine life such as mollusks, crustaceans, and marine plants were collected from the harbors of Sasebo, Yokosuka, and Nakagusuku Wan in 2025. Marine life samples were also analyzed using a germanium detector with a multichannel analyzer. The results of these analyses are shown in Table 2. No cobalt-60 was detected in these samples of marine life.

TABLE 2
RESULTS OF MARINE LIFE SAMPLES

SASEBO HARBOR

Sample Type	Co-60 Analytical Results (Bq/kg)	Other Non-Naturally Occurring Radionuclides (Bq/kg)
Mollusk	<2.26	None
Crustacean	<0.63 – <0.89	None
Plant	<3.07	None

NAKAGUSUKU WAN

Sample Type	Co-60 Analytical Results (Bq/kg)	Other Non-Naturally Occurring Radionuclides (Bq/kg)
Mollusk	<1.30	None
Crustacean	<0.85	None
Plant	<2.78 – <3.70	None

YOKOSUKA HARBOR

Sample Type	Co-60 Analytical Results (Bq/kg)	Other Non-Naturally Occurring Radionuclides (Bq/kg)
Mollusk	<1.44 – <1.59	None
Crustacean	<1.59	None
Plant	<2.48	None

Notes:
(1) Results with a "<" symbol contained less than the minimum detectable concentration. The minimum detectable concentration may differ from sample to sample or quarter to quarter due to differences in the amount of naturally occurring radioactivity in each sample, differences in detection equipment, statistical fluctuations and variations in sample size.
(2) Values given as "<X – <Y" reflect the range of minimum detectable concentrations measured for individual samples.
(3) One becquerel per kilogram (Bq/kg) equals 0.027 picocurie per gram.

CONCLUSION

The results of this environmental monitoring show that there has been no increase in radioactivity above background levels in the Sasebo, Yokosuka, and Nakagusuku Wan environment as a result of U.S. naval nuclear-powered ship operations. These results confirm that procedures used by the U.S. Navy to control radioactivity are effective in protecting the environment and the health and safety of the general public.

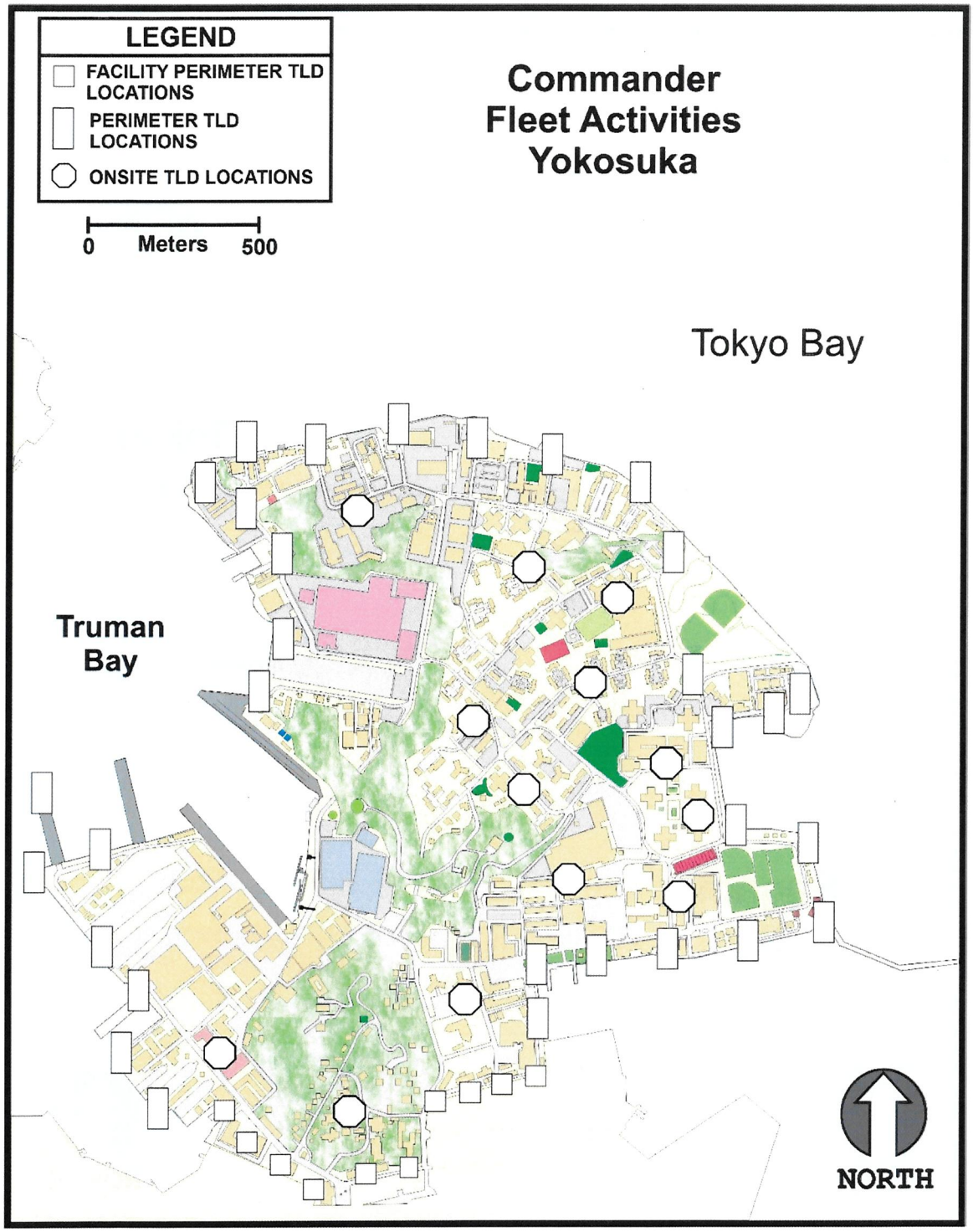

Figure 1 – Environmental Radiation Monitoring Survey Chart
On-Site and Perimeter TLD Locations
Yokosuka, Japan

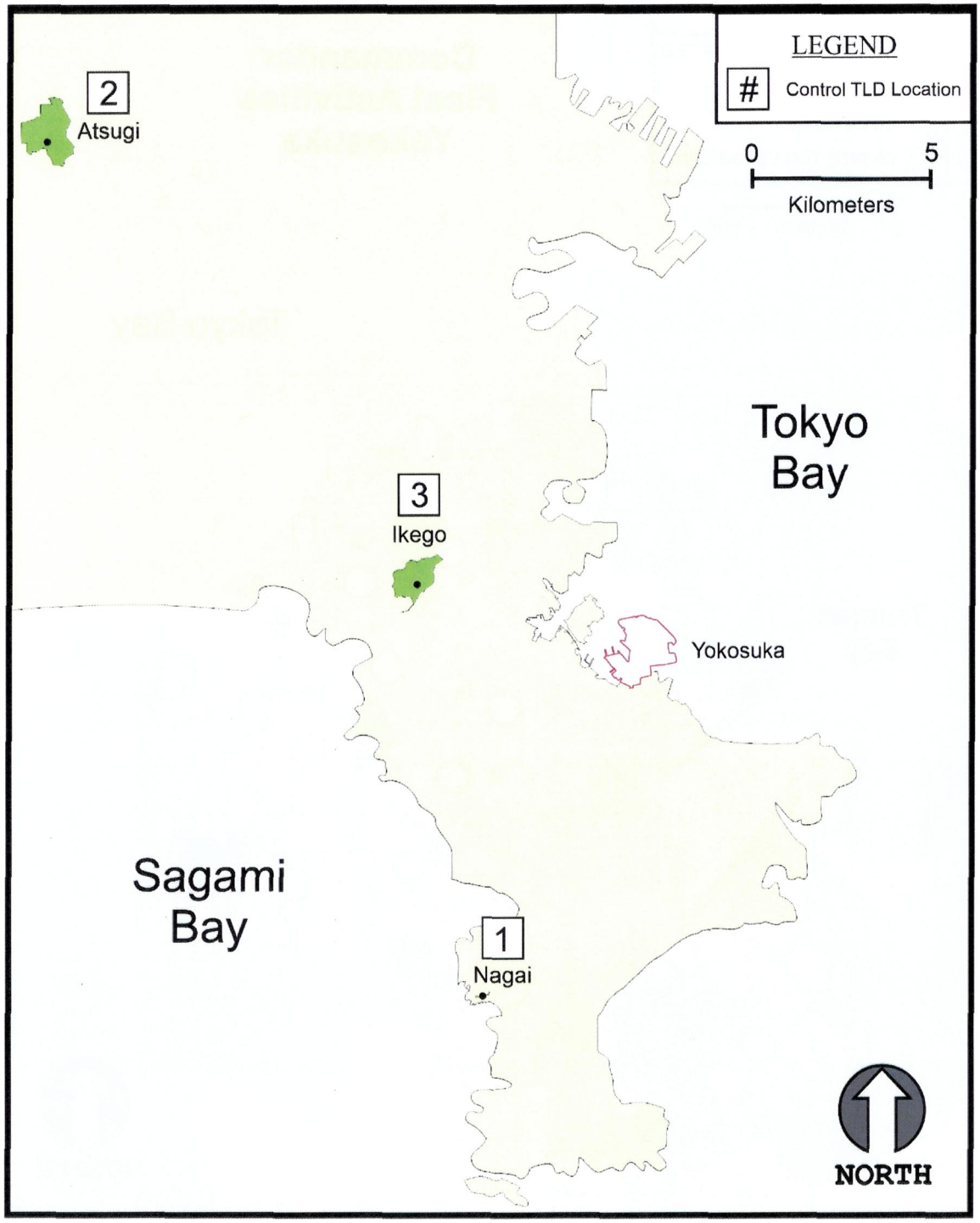

Figure 2 – Environmental Radiation Monitoring Survey Chart
Control TLD Locations
Yokosuka, Japan

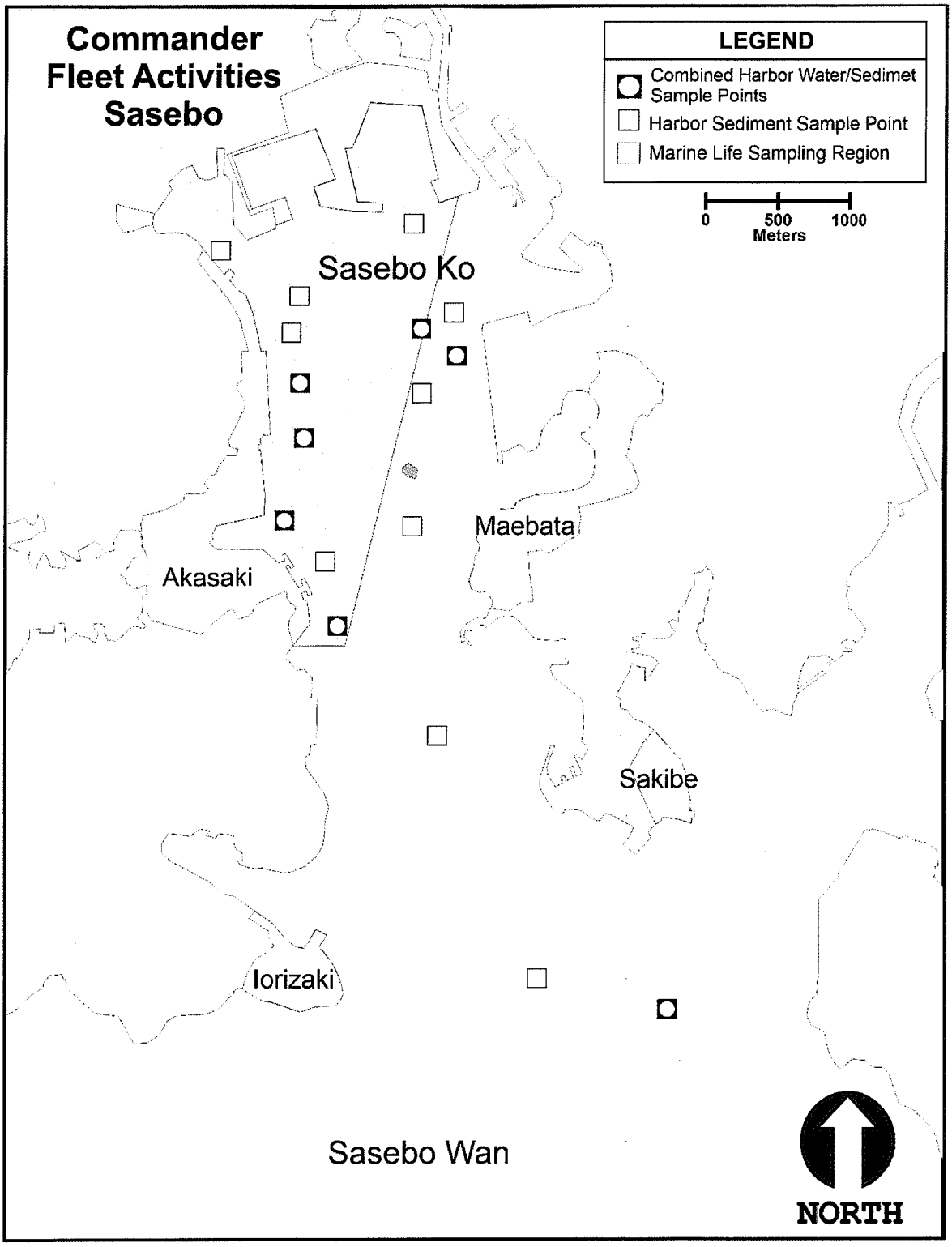

Figure 3 – Environmental Monitoring Survey Chart
Sasebo Harbor, Japan

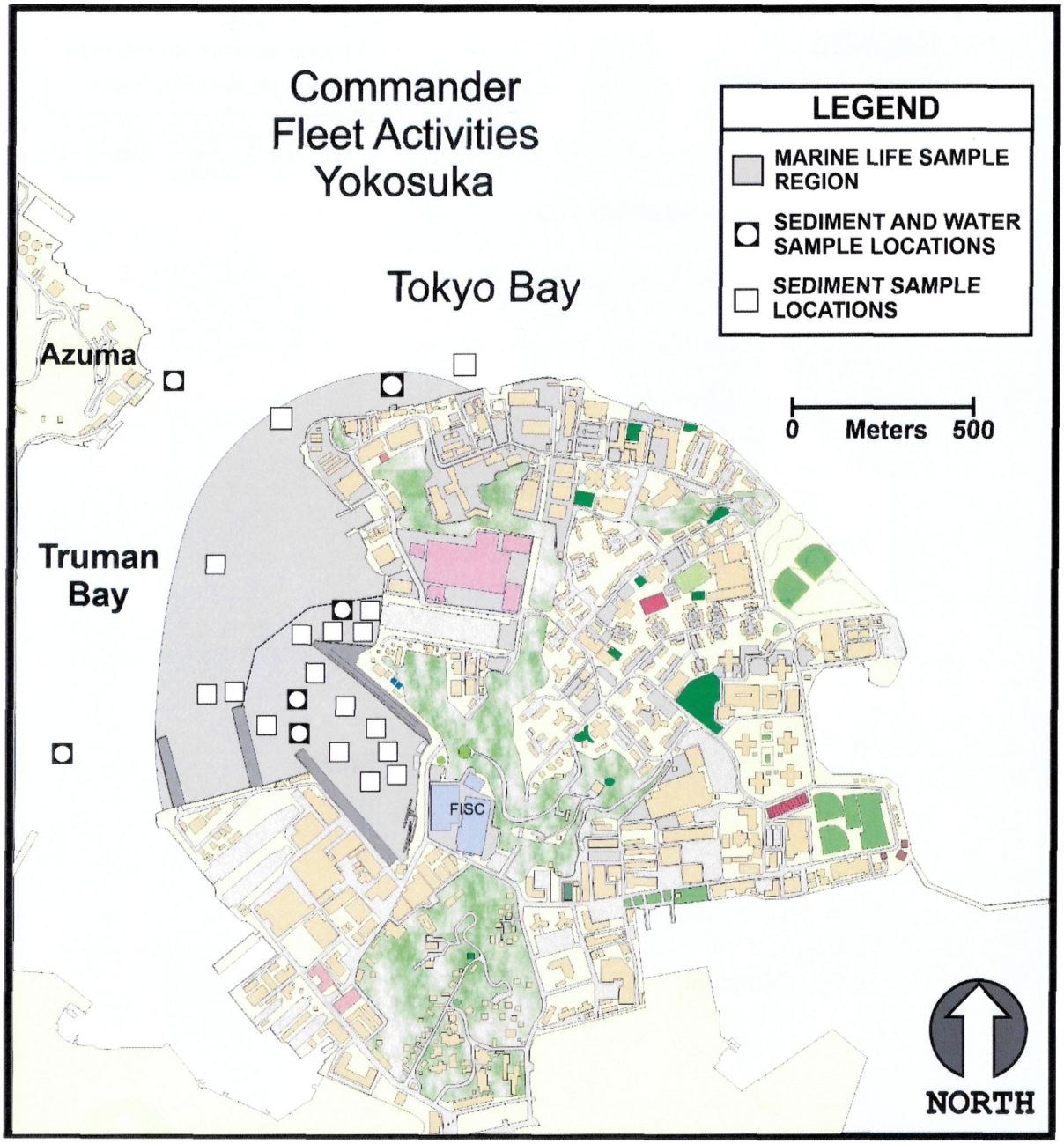

Figure 4 – Environmental Monitoring Survey Chart
Yokosuka Harbor, Japan

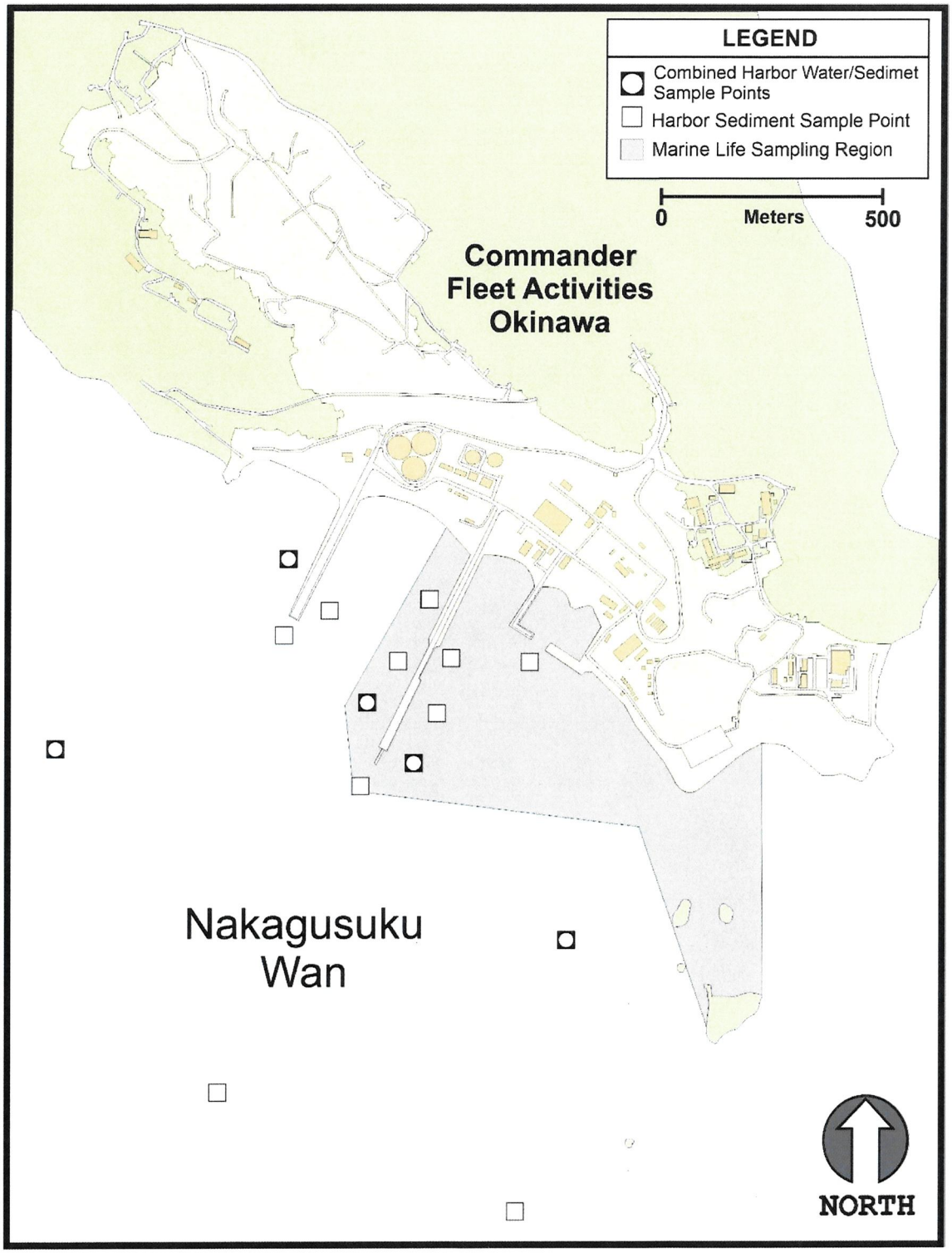

Figure 5 – Environmental Monitoring Survey Chart
Nakagusuku Wan, Okinawa Island