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INITIAL ASSESSMENT STUDY OF PORTSMOUTH NAVAL SHIPYARD PORTSMOUTH, NEW HAMPSHIRE

NEESA 13-032

NAVAL ENERGY AND ENVIRONMENTAL
SUPPORT ACTIVITY
Port Hueneme, California 93043

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INITIAL ASSESSMENT STUDY

NAVAL SHIPYARD, PORTSMOUTH, NEW HAMPSHIRE

UIC: 00102

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NAVY ASSESSMENT AND CONTROL
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Naval Energy and Environmental Support Activity (NEESA)
Port Hueneme, California 93043

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EXECUTIVE SUMMARY

This report presents the results of an Initial Assessment Study (IAS) conducted at the Portsmouth Naval Shipyard, Portsmouth, New Hampshire. The purpose of an IAS is to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous materials operations.

Based on information from historical records, aerial photographs, field inspections, and personnel interviews, a total of four potentially contaminated sites were identified at Portsmouth. Each of the sites was evaluated with regard to contamination characteristics, migration pathways, and pollutant receptors.

The study concludes that, while none of the sites poses an immediate threat to human health or the environment, one site warrants further investigation under the Navy Assessment and Control of Installation Pollutants (NACIP) Program, to assess potential long-term impacts. A confirmation study, involving actual sampling and monitoring of the site, is recommended to confirm or deny the existence of the suspected contamination and to quantify the extent of any problems that may exist. The site recommended for confirmation is the Jamaica Island Landfill, which is an area that was used for disposal of a variety of potentially toxic and hazardous materials over a 25-year period.

The results of the confirmation study will be used to evaluate the necessity of conducting mitigating actions or cleanup operations.

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FOREWORD

The Navy initiated the Navy Assessment and Control of Installation Pollutants (NACIP) program in OPNAVNOTE 6240 ser 45/733503 of 11 September 1980. The purpose of the program is to systematically identify, assess, and control contamination of the environment resulting from past hazardous materials management operations.

An Initial Assessment Study (IAS) was performed at the Naval Shipyard (NSY), Portsmouth, New Hampshire by a team of specialists from Roy F. Weston, Inc. of West Chester, Pennsylvania. Further confirmation study under the NACIP program was recommended at one area at the activity. Chapters dealing with significant findings, conclusions, and recommendations are presented in the earlier chapter of the report. The later technical chapters provide more in-depth discussion on important aspects of the study.

Questions regarding NACIP should be referred to the Commanding Officer, NEESA 112N, Port Hueneme, California 93043, AUTOVON 360-3351, FTS 799-3351, or commercial (805) 982-3351.

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CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. Past hazardous waste disposal methods, although acceptable at the time, have often caused unexpected long-term problems through the release of hazardous pollutants into the soil and groundwater. In response to increasing national concern regarding these problems, Congress directed the Environmental Protection Agency (EPA) to develop a comprehensive national program to manage past disposal sites. The program is outlined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of December 1980.

1.1.1 DoD Program. Department of Defense (DoD) efforts in this area preceded the nationwide CERCLA program. In 1975, the U.S. Army developed for DoD a pilot program to investigate past disposal sites at military installations. In 1980 DoD defined the program as the Installation Restoration Program, and instructed the services to comply with program guidelines.

1.1.2 Navy Program. The Navy manages its part of the program, the Navy Assessment and Control of Installation Pollutants (NACIP), in three phases. Phase 1 identifies potential threats to human health or the environment caused by past hazardous substance storage, handling, or disposal practices at naval activities. Phase 2 analyzes contaminants present at sites of concern and determines their migration paths. Phase 3 provides the required corrective measures to mitigate or eliminate confirmed problems.

1.2 AUTHORITY. The Chief of Naval Operations initiated the NACIP Program in OPNAVNOTE 6240 of 11 September 1980. The Naval Facilities Engineering Command (NAVFAC) manages the program within the existing structure of the Naval Environmental Support Service (NEPSS). Thus, the Naval Energy and Environmental Support Activity (NEESA) conducts the program's Phase 1 Initial Assessment Studies in coordination with NAVFAC Engineering Field Divisions (EFD's). Activities are selected for an Initial Assessment Study (IAS) by the Chief of Naval Operations (CNO), based on recommendations by the Naval Facilities Engineering Command (NAVFAC), the regional EFD's, and NEESA. CNO specifically approved the Portsmouth Naval Shipyard, Portsmouth, New Hampshire, for an IAS by CNO letter serial 451/397464 of August 1981.

1.3 SCOPE.

1.3.1 General. The Navy Assessment and Control of Installation Pollutants (NACIP) program examines potential threats to human health or the environment that may result from past releases of hazardous materials and wastes. This effort represents a complex program, which is one aspect of the total Navy environmental quality program. Generally, potentially contaminated sites were the result of both deliberate acts (i.e., disposal) and accidental acts such as spills. Under the NACIP program, sites are investigated where those actions have stopped and are no longer continuing. The current and future consequences of these potential sites are addressed by the NACIP program. Current hazardous

materials/hazardous wastes operations are subject to other environmental regulations and are addressed under existing programs. The NACIP program examines releases that are historical, not addressed in other programs, and might otherwise be overlooked.

1.3.2 Past Operations. The NACIP program focuses attention on past hazardous substance storage, use, and disposal practices on Navy property. Current practices are regularly surveyed for conformity to state and Federal regulations, and therefore, are not included in the scope of the NACIP program. The IAS report addresses operating disposal and storage sites only if they were disposal areas in the past. Similarly, current operations are investigated solely to infer what types and quantities of chemicals were used, and what disposal methods were practiced.

1.3.3 Results. An IAS recommends, if necessary, mitigating actions to be performed by the activity or EFD, or sampling and monitoring (confirmation studies) to be administered by the EFD under the NACIP program. Based on these recommendations, NAVFAC schedules confirmation studies for those sites determined by scientific and engineering judgment to be potential hazards to human health and the environment.

1.4 INITIAL ASSESSMENT STUDY.

1.4.1 Records Search. The IAS begins with records searches at various government agencies including the EFD's, the national and regional archives and record centers, and U.S. Geological Survey offices. In this integral step, study team members review records to assimilate information about the activity's mission, industrial processes, waste disposal records, and known environmental contamination. Typical examples of records include activity master plans and histories, environmental impact statements, cadastral records, and aerial photographs. Appendix A lists the agencies contacted during this study.

1.4.2 Onsite Survey. After the records search, the study team conducts an onsite survey to complete documentation of past waste-processing and disposal operations and to identify potentially-contaminated areas. With the assistance of an activity point of contact, the team inspects the activity during ground and aerial tours, and interviews long-term employees and retirees. The onsite survey for the Portsmouth Naval Shipyard was conducted from 6 through 10 December 1982; report information is current as of those dates.

1.4.2.1 Data Verification. Information obtained from interviews is verified by data from other sources before inclusion in the report. If information for certain sites is conflicting or inadequate, the team may collect samples for clarification.

1.4.3 Confirmation Study Ranking System. With information collected during the study, team members evaluate each site for its potential hazard to human health and the environment. A two-step confirmation study ranking system (CSRS), developed at NEESA, is used to systematically evaluate the relative severity of potential problems. As the first step, a flow chart based on type of

waste, type of containment, and hydrology, eliminates innocuous sites from further consideration. If the flow chart indicates a site has potential contamination, a rating model is applied. The rating model assigns a numerical score from 0 to 100 to each site. The score reflects the characteristics of the wastes, the potential migration pathways from the site, and possible contaminant receptors on and off the activity.

1.4.4 Site Ranking. After rating a site, engineering judgment is applied to determine the need for a confirmation study or an immediate mitigating action. At sites recommended for further work, CSRS scores are used to develop a priority list for scheduling projects. For a more detailed description, refer to NEESA Confirmation Study Ranking System (NEESA 20.2-042).

1.4.5 Confirmation Study Criteria. A confirmation study is recommended for sites at which sufficient evidence exists to indicate the presence of contamination, if the suspected contamination poses a potential threat to human health or the environment.

1.5 CONFIRMATION STUDY. The EFD conducts the confirmation study, which in itself has two phases--verification and characterization. In the verification phase, short-term analytical testing and monitoring determines whether specific toxic and hazardous materials, identified in the IAS, are present in concentrations considered to be hazardous. If required, a characterization phase, using longer-term testing and monitoring, provides more detailed information concerning the horizontal and vertical distribution of migrating contamination from sites, as well as site hydrogeology. If sites require remedial actions or additional monitoring programs, the confirmation study recommendations include the necessary planning information for the work, such as design parameters.

1.6 IAS REPORT CONTENTS. In this report, the significant findings, conclusions, and recommendations from the IAS are presented in Chapters 2 and 3. Chapter 4 describes general activity information, history, physical features, and biology. Chapters 5 through 8 trace the use of chemicals and hazardous materials, from storage and transfer, through manufacturing and operations, to waste processing and disposal. The later chapters provide detailed documentation to support the findings and conclusions in Chapters 2 and 3. Figure 1-1 shows the location of the Portsmouth Naval Shipyard.

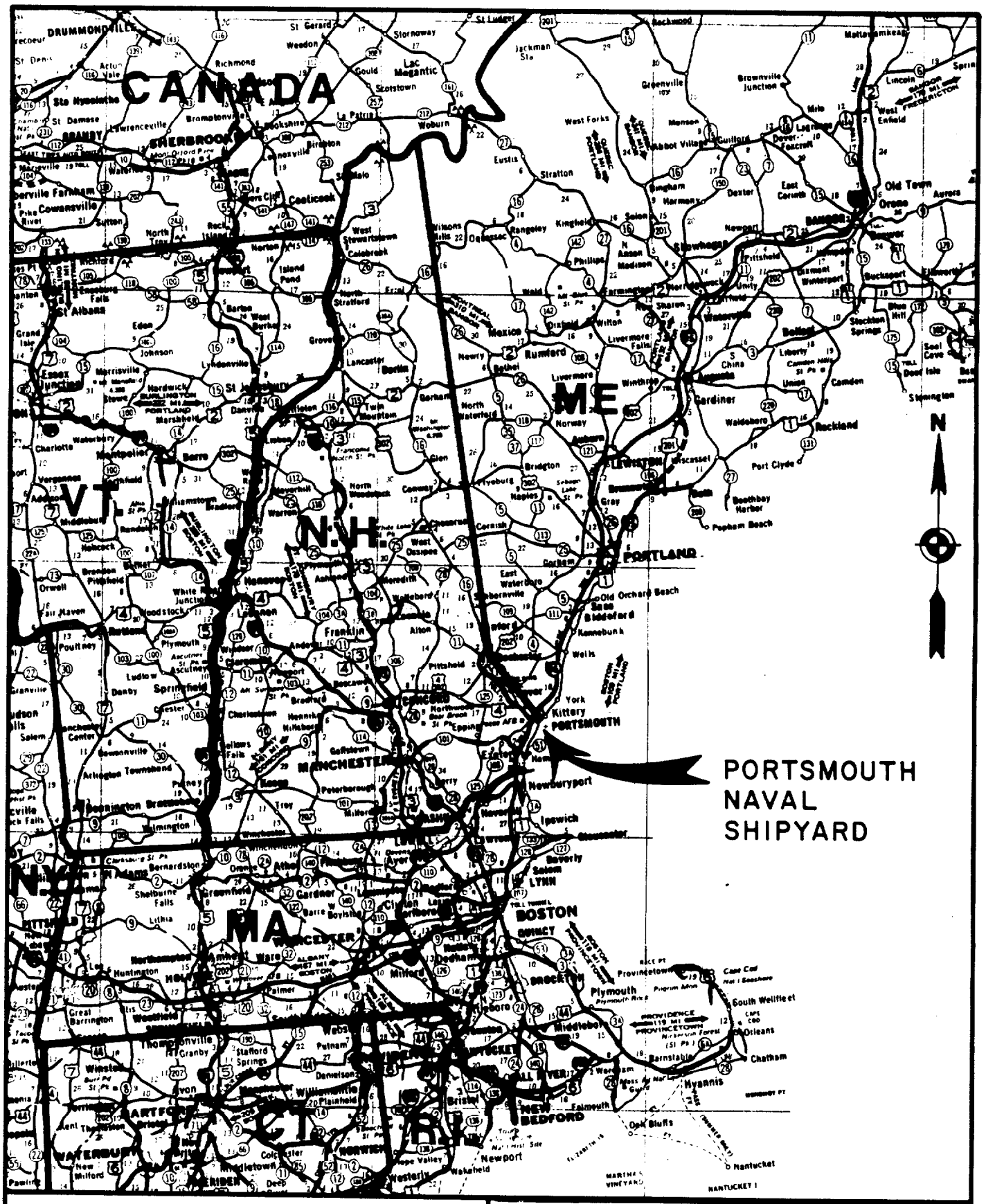


FIGURE 1-1
VICINITY MAP

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

CHAPTER 2. SIGNIFICANT FINDINGS AND CONCLUSIONS

2.1 INTRODUCTION. Four sites/areas were identified that were used in the past for disposal of hazardous materials. Figure 2-1 illustrates the locations of the sites identified during the onsite survey. One of these sites appears to present a potential hazard to the environment and is recommended for a confirmation study. Three sites do not appear to present hazards to the environment or the public health and are not recommended for confirmation studies.

2.2 SITE RECOMMENDED FOR CONFIRMATION.

2.2.1 Site 1, Jamaica Island Landfill. This entire area was originally a tidal flat and was used for disposal of general refuse, trash, and other materials from about 1946-1976.

2.2.1.1 Wastes Present. Many types of materials now considered hazardous were deposited at this site. Some of the most significant wastes are shown in Table 2-1.

2.2.1.2 Migration Pathways. From inspections of boring logs and other documents the site appears to be underlain by sporadic clay deposits, but consists mostly of sand and gravel, cobbles, and boulders. After the dredge spoils were laid down over the landfill in 1978 a 2-foot clay cap was constructed over that portion of the landfill. A clay barrier on the inside of the rock dike was also constructed to prevent runoff into the Piscataqua River. The clay liner on the bottom only extends about 5 feet horizontally into the fill. Tidal fluctuations (10 feet) may be causing an inundation of the landfill and the dredge spoils layer on top of the landfill. This is probably causing a flushing action to occur whereby contaminants from the landfill could be migrating out from underneath the landfill and into the Piscataqua River.

2.2.1.3 Receptors Affected. Leaching of hazardous waste buried at this site may result in the accumulation of contaminants in sediments in the Piscataqua River bordering the disposal area. Upstream or downstream transport of the pollutants is severely limited due to a rock breakwater between Seavey Island and Clark's Island that blocks the original tidal excursion route. This effect, combined with the persistent chemical nature of some of the contaminants, suggests the possibility that hazardous materials may have accumulated in the sediment in significant concentrations. Consequently, the potential exists for impacts on the biota endemic to and supported by the area.

Because the area is used for commercial fishing of lobster and other human edibles, this site constitutes a potential threat to human health.

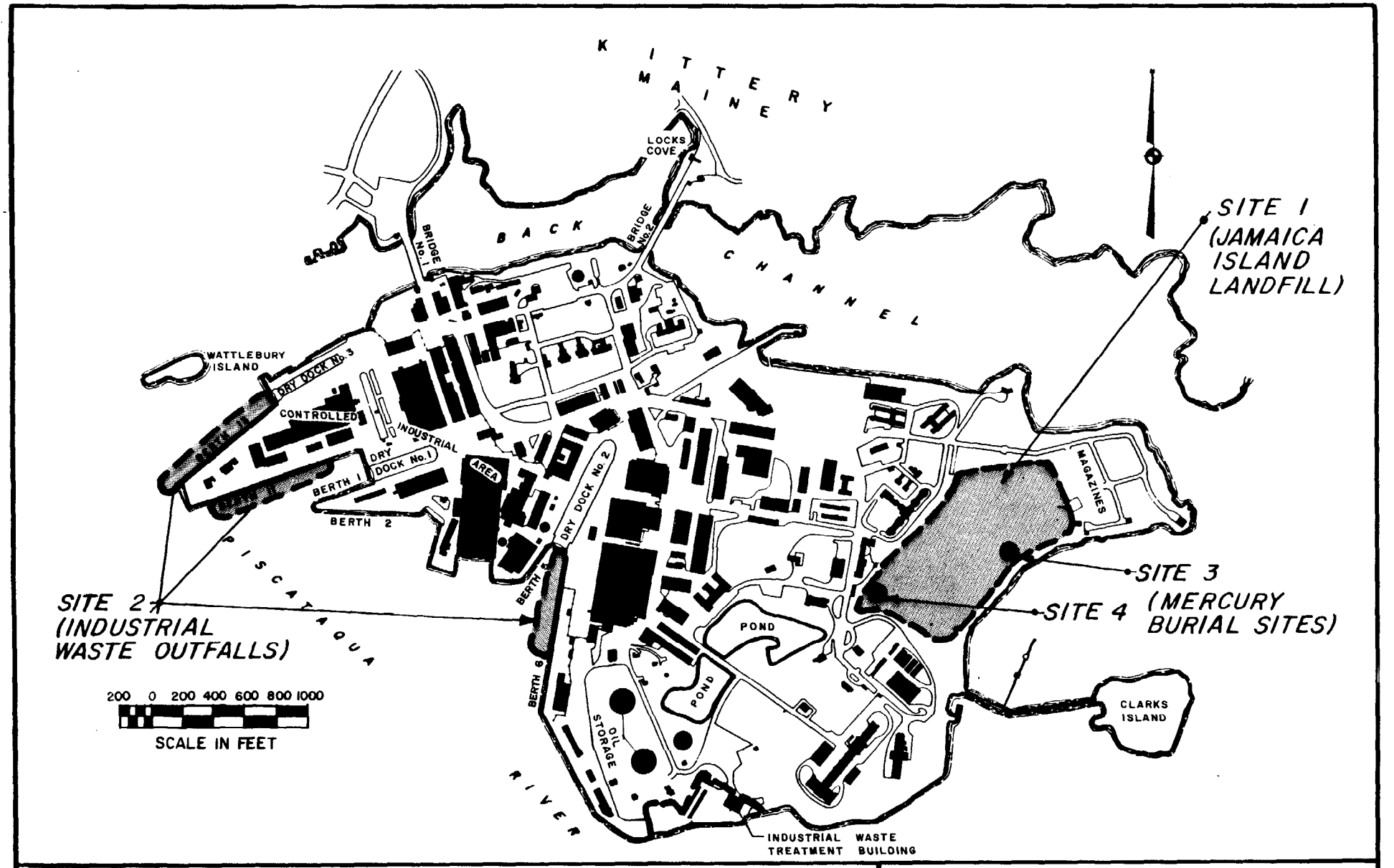


FIGURE 2-1
PORTSMOUTH NSY DISPOSAL SITES

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL SHIPYARD

Table 2-1

Hazardous Materials Disposed of at Site 1, Jamaica Island Landfill

Substance	Estimated Quantity	Time Period	Comments
Plating sludges			
Chrome	5,000 - 10,000 pounds	1945-1972	Sludges were mixed in with normal refuse and were disposed of directly into the landfill. Exact location unknown.
Lead	5,000 - 10,000 pounds	1945-1972	
Cadmium	5,000 - 10,000 pounds	1945-1972	
Asbestos insulation	Several thousand pounds	1945-1960	Exact location unknown.
Volatile organics			
TCE, methylene chloride, toluene, MEK	20,000 gallons	1955-1975	Drums were taken to the landfill where wastes were drained out directly onto the ground.
Acetylene and chlorine gas cylinders	100-200 cylinders	1955	Cylinders were buried full.
Contaminated dredge spoils containing:		1978	Total spoils deposited was 108,000 cubic yards. Small amounts of PCBs and mercury were also found in dredge spoils. Dredge material came from sediments at Berths 6, 11, 13.
Chromium	5,000 pounds		
Lead	20,000 pounds		
Waste paints and solvents	500,000 gallons	1945-1965	Probably disposed of in whole drums.
Spent sandblasting grit	50,000 tons/year	1945-1975	Scattered throughout the site.

2.2.1.4 Conclusions. Because it has been confirmed that potentially hazardous waste materials were deposited at this site in the past and a migration pathway appears to exist that could cause a threat to human health, this site is recommended for a confirmation study.

2.3 SITES NOT RECOMMENDED FOR CONFIRMATION.

2.3.1 Site 2, Industrial Waste Outfalls. These outfalls are located at the southeast section of the Shipyard near the controlled industrial area. They were operated during 1945-1975. Prior to operation of the industrial waste treatment plant in 1975, all wastewaters were discharged directly into the Piscataqua River through these outfalls.

2.3.1.1 Wastes Present. From a review of a dredging study conducted in 1977 at the Portsmouth Naval Shipyard there is documented evidence that the berth areas, specifically, Berths 6, 11, and 13, contain contaminated sediments. From a review of the sewerage plans it was discovered that industrial wastewaters from the plating shop, battery shop, and other similar activities were discharged directly into these areas, and are the probable cause of the contamination found in the sediments.

As part of the dredging study in 1976, 22 sediment samples were analyzed; 13 of these samples were surface samples and the remaining 9 were taken at the proposed dredge depth. A review of the data in the dredging report shows that some potentially toxic pollutants are present in quantities greater than that normally found in nearshore sediments. Specifically, copper, lead, and zinc were among those found, as well as levels of mercury and cyanide in a few locations. "Levels of PCBs at most of the 22 stations were comparable with concentrations reported for polluted areas (disposal sites and industrial areas)" (Parsons et al., 1978).

During the dredging activities much of this contaminated sediment was disposed of at Site 1 (Jamaica Island landfill), which was discussed previously. It is difficult to determine how much of the sediment in the berth area or the entire waterfront area adjacent to the berths may still be contaminated.

It must also be noted that the sampling locations chosen for the dredging study in 1976 were only in the immediate area of the berths to be dredged (Berths 6, 11, and 13). No firm data exist for other areas in the channel.

2.3.1.2 Migration Pathway. The migration pathway is clearly a direct discharge through outfalls into the Piscataqua River. These wastewaters contained pollutants and contaminants that might have settled to the bottom of the river and contaminated the existing sediments.

2.3.1.3 Receptors Affected. As previously discussed, the flushing of heavy metals and other dense contaminants from the sediments surrounding the Shipyard is slow, and accumulation and retention are persistent. The sediments in the vicinity of the industrial waste outfalls vary considerably, ranging from sandy mud to gravel. Epifaunal species supported by the area include several crab species, lobster, and echinoderms. Of the epibenthic species, only the lobster

is presently subject to intensive commercial and recreational harvesting. The rock crab is taken in limited numbers by both commercial and sport fishermen. In addition, the general Shipyard area may be used by both resident and migratory fish as feeding, spawning, and nursery grounds.

2.3.1.4 Conclusions. The discharge from the outfalls has been stopped since 1975 and much of the contaminated sediments were removed and placed on top of the landfill at Jamaica Island, as noted in subsection 2.2.1.2. The strong tidal currents in the area have probably acted to disperse the remaining contaminated sediments such that their concentration is low. This site is not recommended for a confirmation study; however, recommendations are given in Chapter 3 for additional sampling during the next dredging activity at the Shipyard.

2.3.2 Site 3, Mercury Burial Site. In June 1981 the Shipyard notified EPA under CERCLA (Superfund) of the existence of a mercury waste burial site on the installation. Actually, two mercury burial sites were identified in the EPA notification. The other site is discussed under subsection 2.2.4.

2.3.2.1 Wastes Present. Site 3 was used in 1973 for the disposal of mercury-contaminated wastes such as fluorescent bulbs, thermometers, and mercury switches. Even items such as brooms, rags, and dustpans used to clean up broken items containing mercury were disposed of at this site. In excess of 1,000 pounds of this bulk waste was disposed of, but the actual amount of elemental mercury involved was probably in the range of 1 to 2 pounds.

The waste was encapsulated in 4-foot diameter concrete pipe sections, which were capped with 1 foot of poured concrete on the top and bottom. Six of these vaults are reported to be buried under approximately 8 to 10 feet of fill at Site 3. This site is not marked in the field, but the Shipyard Public Works Engineering Office has documented the location of the site on site drawings.

2.3.2.2 Migration Pathway. As a result of interviews with Shipyard staff members who actually witnessed the disposal and burial of the mercury wastes, it seems clear that the materials are totally encapsulated and secure from any intrusion of water. It appears that the relatively small amount of elemental mercury buried at the site has no migration pathway to the Piscataqua River or any other receptors.

2.3.2.3 Conclusions. Based on the information discovered about Site 3 during the onsite survey, it is not recommended for a confirmation study. It is recommended, however, that the Shipyard mark the site in the field to prevent any disturbance during possible future excavation or construction work in that vicinity.

2.3.3 Site 4, Mercury Burial Site. This site is located at the Jamaica Island landfill, and is shown on Figure 2-1.

2.3.3.1 Wastes Present. As noted in the previous subsection, Site 4 was also the site for disposal of mercury-contaminated wastes. This site was used in 1974-1975, and also consists of six concrete vaults containing mercury-contaminated bulk waste, and is also covered with 8 to 10 feet of fill.

2.3.3.2 Migration Pathways. Since the vaults are totally enclosed with concrete it appears unlikely that any migration pathway is likely to exist that could cause an adverse impact on the environment or the public health.

2.3.3.3 Conclusions. Based on the information discovered about Site 4 during the onsite survey it is not recommended for a confirmation study. It is recommended, however, that the Shipyard mark the site in the field to prevent any disturbance during possible future excavation or construction work in that vicinity.

CHAPTER 3. RECOMMENDATIONS

3.1 BACKGROUND. Based on the significant findings and conclusions discussed in Chapter 2, there is one area at the Shipyard thought to be potentially contaminated and which may pose a threat to human health or to the environment, on or off the installation.

A program to verify the presence or absence of contamination surrounding the site at the Shipyard should include sediment samples and tissue samples from the major taxonomic groups present in the area.

The necessity for analyses of biological samples will be contingent on the results of sediment analyses. However, it is recommended that biological sampling be performed coincident with sediment sampling to reduce the overall costs of the confirmation study.

Biological samples can be analyzed for suspect contaminants only if sediment concentrations meet or exceed coastal water quality criteria for toxic substances as established by the U.S. Environmental Protection Agency. A brief description of the suggested confirmation program for the site is provided in the sections that follow.

3.1.1 Confirmation Studies. The identification of the sites recommended for confirmation was based on engineering judgement and application of the Confirmation Study Ranking Flow Chart. One site is recommended for confirmation, and the study plan for this site is described in later sections of this chapter.

3.1.2 Confirmation Study Ranking System. Hazardous waste sites identified by the IAS team were evaluated using a Confirmation Study Ranking System (CSRS) developed by NEESA for the NACIP program. The system is a two-step procedure for systematically evaluating a site's potential hazard to human health and the environment based on evidence collected during the IAS.

Step 1 of the system is a flow chart that eliminates innocuous sites from further consideration. Step 2 is a ranking model that assigns a numerical score, within a range of 0 to 100 to indicate the potential severity of the situation at a site. The scores are a reflection of the characteristics of the wastes disposed of at a site, contaminant migration pathways, and potential contaminant receptors on and off the installation. Confirmation Study Ranking System scores and engineering judgement are then used to evaluate the need for a confirmation study. The scores assigned to sites recommended for confirmation studies also assist Navy managers in establishig priorities for accomplishing the recommended actions.

The Confirmation Study Ranking System score for Site 1, the Jamaica Island Landfill, is 22.4.

A more detailed description of the Confirmation Study Ranking System is contained in NEESA Report 20.2-04.

3.2 SITE 1, JAMAICA ISLAND LANDFILL.

3.2.1 Confirmation Study Ranking System.

3.2.2 Sediment Cores. A total of 10 sediment core samples should be collected in the Clark's Island embayment. Sampling sites should be identified utilizing a systematic grid technique with sampling weighted towards the suspected pollution source (see Figure 3-1). Two additional samples should be collected as controls at sites sufficiently removed from the embayment.

3.2.3 Benthic Samples. Benthic grab samples should be collected at the same sites identified for sediment collection in order to provide correlative information. Samples will be sorted and molluscs and annelids separated and processed for further analyses. Benthic analysis will not be performed, however, unless warranted as a result of the sediment analysis. The need for further sampling of other species can be determined after the results of the benthic and sediment samples are analyzed.

3.2.4 Parameters of Interest. All samples should be preserved and assessed for concentrations of suspected contaminants as prescribed by Standard Methods for Examination of Water and Wastewater. Contaminants for which samples should be analyzed include chromium, lead, cadmium, trichloroethylene, methylene chloride, toluene, methyl ethyl ketone, and polychlorinated biphenyls (PCB).

3.3 ADDITIONAL RECOMMENDATIONS. There are some actions that can be taken to minimize the potential for creating a situation that could be a threat to human health or the environment at the Shipyard.

3.3.1 Site 2, Industrial Wastewater Outfalls. The berth area at the Shipyard will probably be scheduled for dredging activities some time in the future. Prior to the dredging, a dredge and fill permit must be obtained and appropriate environmental assessments will need to be conducted.

As part of the requirements to obtain a permit, sediment sampling will probably have to be conducted. It is recommended that an expanded sediment sampling program be designed at that time to include other areas in the Piscataqua River in addition to the areas proposed to be dredged. This would provide a more complete assessment of the distribution of potentially contaminated sediments in the general vicinity of the Shipyard's industrial area. Depending on the concentration and distribution of contaminated sediments found at that time, further investigations and analyses can be defined better.

3.3.2 Sites 3 and 4, Mercury Burial Sites. These sites are not recommended for confirmation studies because the mercury wastes are totally encapsulated in concrete vaults and are buried about 8 feet beneath the ground surface. It is recommended that these burial sites be clearly marked in the field with appropriate warnings to prevent any inadvertent disturbance in the future during construction or excavation activities.

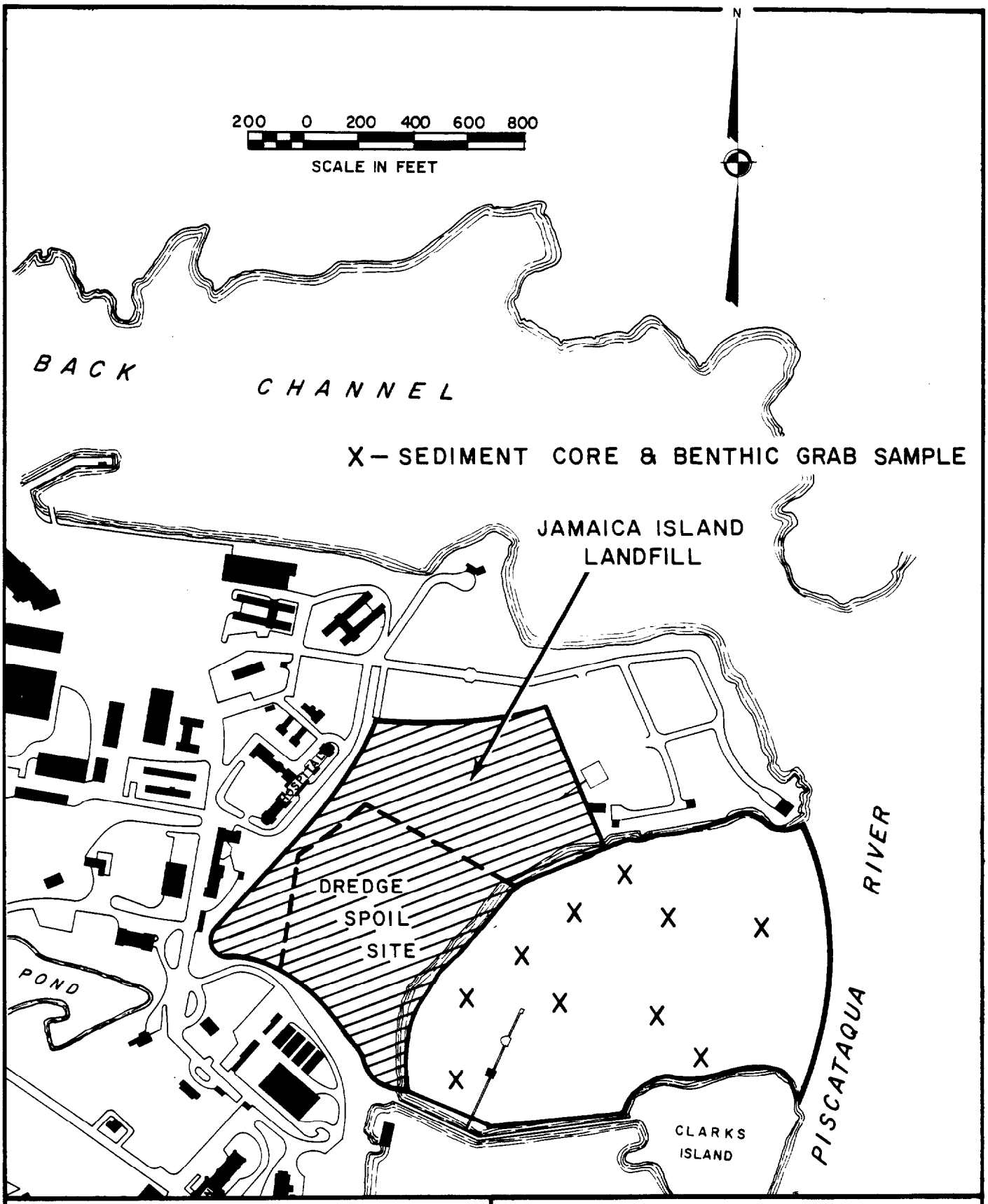


FIGURE 3-1

SITE 1 – JAMAICA ISLAND LANDFILL
RECOMMENDED SAMPLING
SITE LOCATIONS

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

CHAPTER 4. BACKGROUND INFORMATION

4.1 GENERAL INFORMATION.

4.1.1 Location. The Portsmouth Naval Shipyard is situated on Seavey Island in the Piscataqua River, a tidal estuary that is the boundary between New Hampshire and Maine. The Shipyard is about 50 miles north of Boston, Massachusetts, and is actually located in Kittery, Maine about 1 mile northeast of Portsmouth, New Hampshire, the major population center nearest the Shipyard. The largest population center north of the Shipyard is located 50 miles up the coast in Portland, Maine (see Figure 4-1).

The total area of the Shipyard is about 278 acres, 90 acres of which is filled land. The only significant off-base activity is the 25-acre Navy housing complex referred to as Admiralty Village.

4.1.2 Mission. Portsmouth Naval Shipyard's major service to the operating fleet is the overhaul, conversion, and repair of nuclear propulsion fleet balistic missile and attack submarines.

4.1.3 Major Production Facilities. The Shipyard has three dry docks ranging up to SSBN and SSN-688 class capability and 6,500 linear feet of berthing. The berthing consists of six submarine berths, plus berths for yard and service craft.

The Shipyard has 376 buildings and structures totalling over 3.5 million square feet of floor space. The trade shops at the Shipyard are divided into three groups: structural, mechanical/electrical/electronics, and service. The structural group includes the shipfitter, sheet metal, welding, and pipe shops. The inside and outside machine shops, and the electrical and electronics shops are part of the mechanical/electrical/electronics group.

The Shipyard also has a Public Works Department that has three shops: transportation, utilities, and maintenance. The Shipyard maintains a Controlled Industrial Area (CIA) for security reasons. This area includes all of the dry docks and submarine berths, and numerous buildings adjacent to these facilities. Access to the CIA is tightly controlled and limited to individuals having appropriate clearances. Figure 4-2 shows the location of the CIA and the major facilities at the Shipyard. The Shipyard has about 70 officers and enlisted personnel, and over 7,000 civilian workers. Other commands having a tenant relationship with the Shipyard are presented in the next subsection.

The area between the two bridges was placed on the National Register of Historic Places by the National Park Service in 1977. This district includes 54 acres that comprise old Dennett's Island, the site of early shipbuilding activities, and the original Shipyard before the filling operations created the current 278-acre facility.

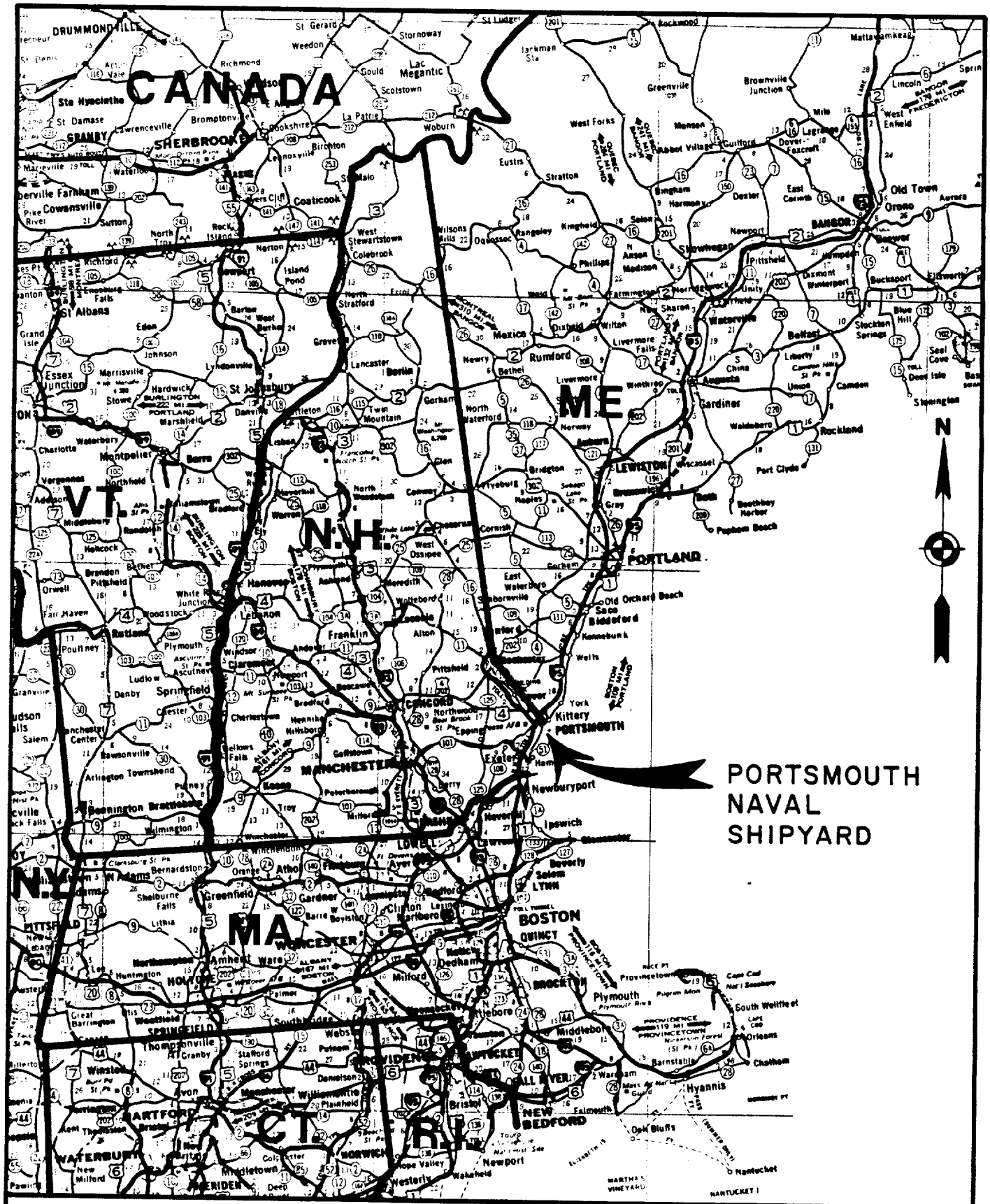


FIGURE 4-1
VICINITY MAP

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

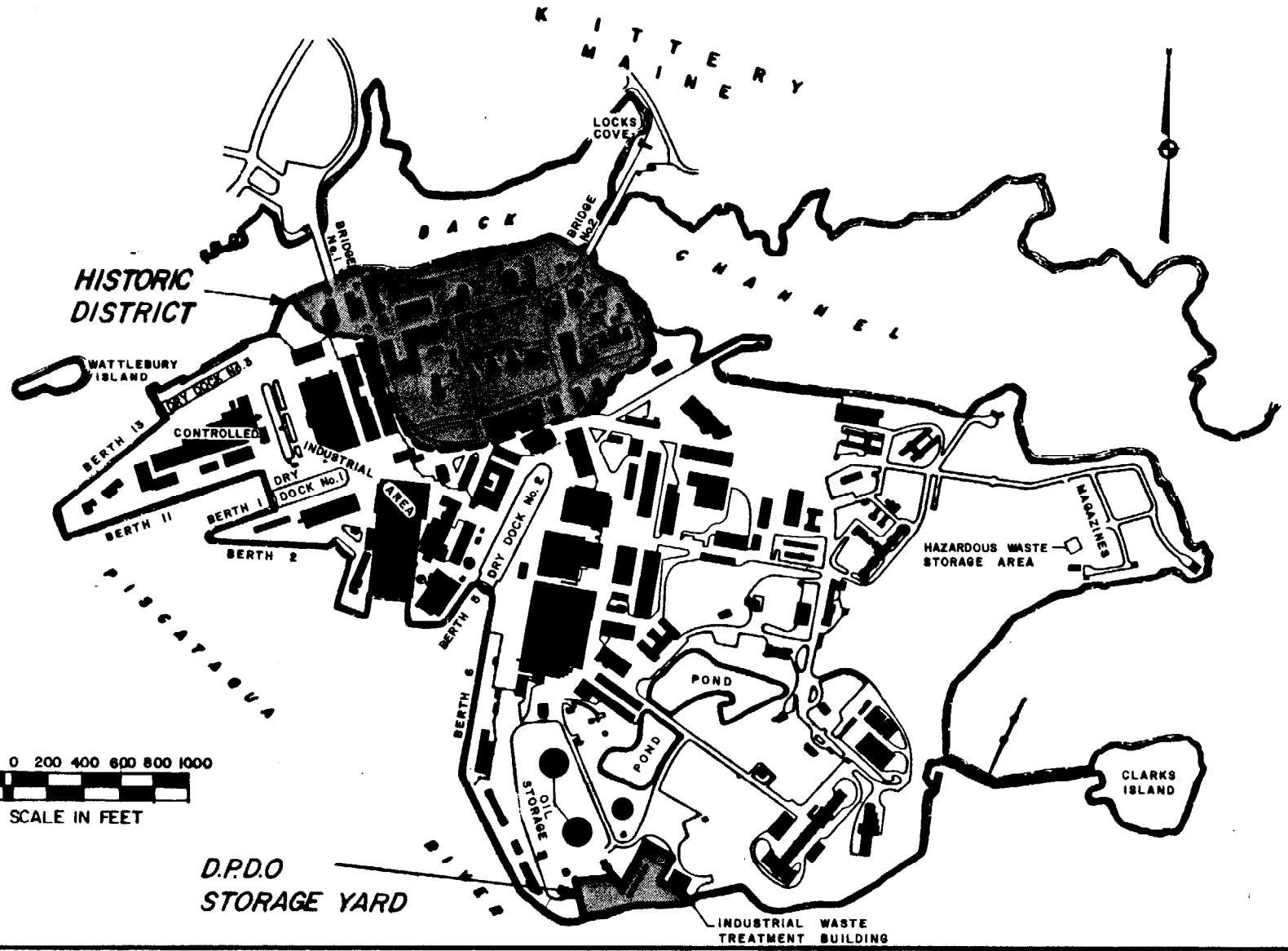


FIGURE 4-2
MAJOR FACILITIES AT PORTSMOUTH N.S.Y.

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

4.1.4 Host/Tenant Relationships. The Shipyard also provides support and/or host services to numerous activities. Table 4-1 illustrates the major functions and number of personnel associated with these tenant activities.

4.2 HISTORY.

4.2.1 Initial Site Selection. With the formation of the Navy Department in 1798, plans were made to establish a Navy yard in the Portsmouth area. After a survey of possible sites by Chief Naval Constructor Humphrie, a 58-acre island in the Piscataqua River adjacent to the Kittery shore, was bought on 12 June 1800 from William Dennett for the sum of $5,500. This was the birth of the Portsmouth Naval Shipyard.

4.2.2 Acquisitions. The Shipyard is actually a group of small islands that were acquired between 1800 and 1959. The areas between the islands were filled in to create one 278-acre parcel of land that is now considered the Shipyard. Figure 4-3 shows these individual islands and how they were connected. After the initial acquisition of Dennett's Island, the next island bought was Seavey's Island in 1866. This was followed by Jamaica Island in 1942, and Clark's Island in 1959. Approximately 90 acres of the Shipyard is filled land.

4.2.3 Significant Developments in the Shipyard's History.

4.2.3.1 Civil War Period. The employment level was 85 mechanics and laborers when the Civil War broke out in April 1861; it had reached a peak of 2,455 in May 1865. Twenty-six vessels were built during this period, including two ironclads and 18 steam sloops. Among the latter was the Kearsage, which defeated the Confederate raider Alabama in a memorable battle.

4.2.3.2 Spanish American War. The war with Spain brought a brief boom in ship overhaul and repair work. At this time, funds were appropriated for the construction of new facilities and buildings, including the Dispensary, Power Plant, Building 86, Dry Dock No. 2, Foundry, and the Naval Prison. The Treaty of Portsmouth, which ended the war between Russia and Japan in 1905, was signed in Building 86, the present Shipyard Administration Building.

4.2.3.3 World War I. In 1914, when the Navy Department was in need of a government yard to produce submarines, the Portsmouth Navy Yard, with its tradition of excellent ship work, was selected. The first Navy-constructed submarine, the L-8, was launched here in 1917, and completed the following year. When this country entered World War I, funds were authorized for a submarine-building program at Portsmouth, and eight undersea craft were under construction during the war years. In addition, a large number of surface ships were overhauled or repaired, and a large volume of electrical fittings and fixtures was manufactured. In 1918 the employment level reached a peak of 5,600, including many women.

Table 4-1

Major Tenant Activities Supported by Portsmouth Naval Shipyard

Activity	Number of Personnel	Major Function
Service Craft	28	Operate and maintain tugs and yard craft
Navy Exchange	15	Retail sales
Naval Reactor Representative Office	10	Administration
Resident Officer in Charge of Construction	14	Administration
Planning and Engineering for Repair and Alteration (Submersible Ship)	168	Engineering and administration
NAVSEA Unified Vendor Evaluation Program	18	Administration
Defense Property Disposal Office	7	Storage/disposition of excess materials
Naval Investigative Service	1	Administration
Computer Application Support and Development Office	96	Administration
Marine Barracks	65	Perimeter security
Regional Medical Clinic	80	Medical care
Publications and Printing Office	19	Printing
Homeported Mine Sweeper	43	Homeport
Naval Reserve Training Center	10	Reserve training

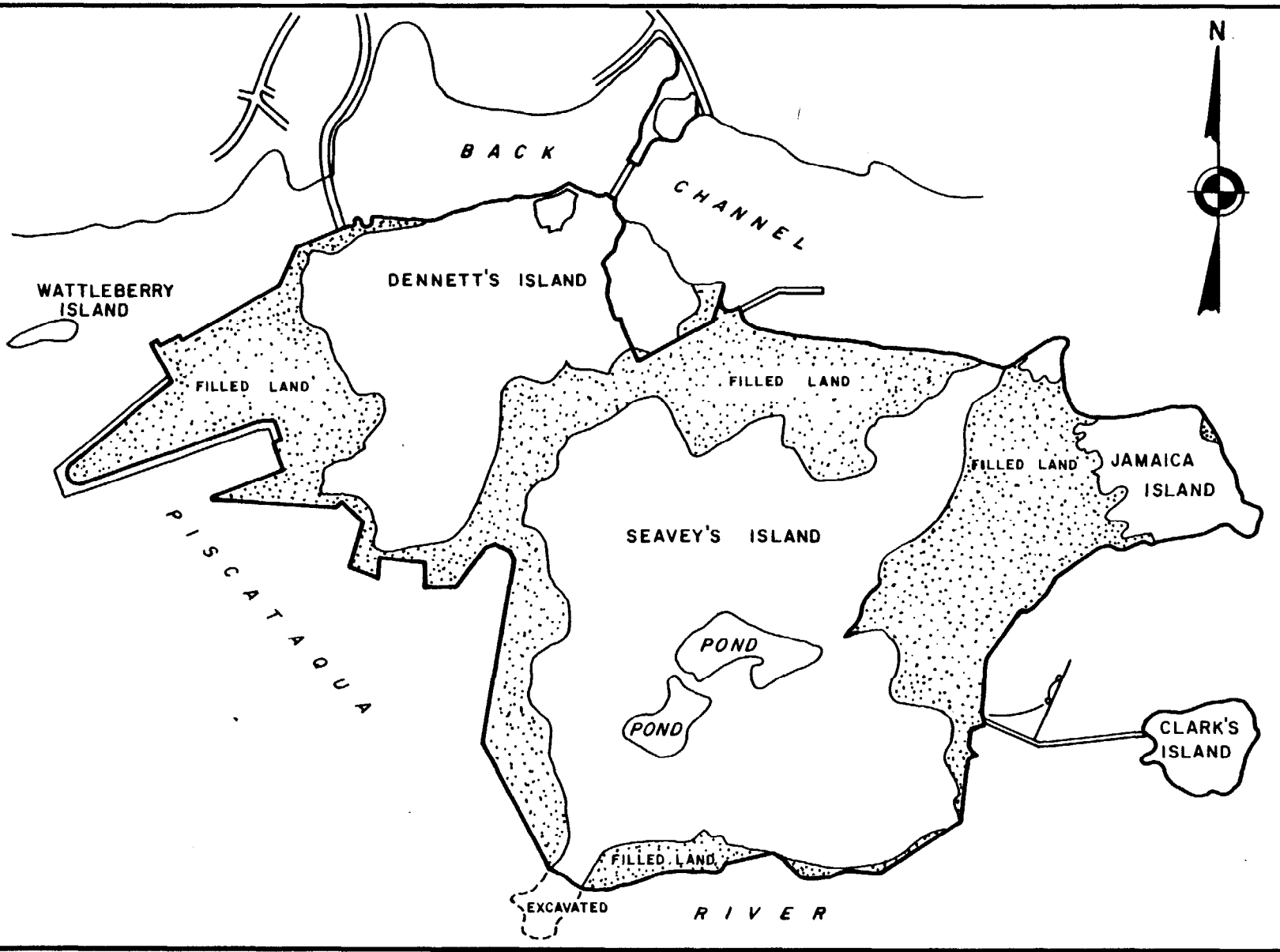


FIGURE 4-3

ISLANDS COMPRISING PORTSMOUTH NAVAL SHIPYARD

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

4.2.3.4 World War II. The entry of the United States into World War II precipitated a tremendous building program. By December 1943 the employment level had reached an all-time high of 20,466, including 3,600 people employed in the Electrical Manufacturing Shop that had been moved into a large vacant plant in Somersworth, New Hampshire.

Seventy-five submarines were built during 1942-1945. Two submarines that had been started at the Cramp Shipbuilding Company in Philadelphia, Pennsylvania, the SS-298 and SS-299, were towed to Portsmouth for completion. Thirty-two submarines were completed during 1944; and on one day, 27 January 1944, four undersea ships were launched. The building time per submarine was reduced from 469 calendar days in 1941 to 173 calendar days in 1944. In addition to new construction, 74 vessels were overhauled or repaired, including 40 submarines and 34 surface craft.

With the end of World War II, Portsmouth entered a new era of submarine design and construction, reaching out into new horizons in hydrodynamics, sonics, and nucleonics.

4.2.3.5 Nuclear Submarine Era. The first nuclear submarine (Swordfish) was launched at Portsmouth in 1958. During the 1960's 10 additional nuclear attack and fleet ballistic missile (FBM) submarines slid down the ways of the Shipyard. The Shipyard has continued to expand its capability and now serves as one of the nation's major facilities for repair, retrofit/conversion/overhaul, and support of the nuclear submarine fleet. In 1980 the Shipyard completed its first conversion of a submarine missile system to Trident 1 capability.

Looking to the future, the Shipyard has developed a comprehensive program of military construction projects. Many of these are in support of the Navy's Engineered Long-Range Modernization Program for Shipyards, which will improve even further the support to the nuclear submarine fleet.

Today there are about 8,500 full-time civilian workers supporting the fleet at the Shipyard.

4.3 PHYSICAL FEATURES.

4.3.1 Topography. The Shipyard is located in the Seaboard Lowland Section of the New England Province. This is a region characterized by low undulating topography that rises gently to the Lakes Country and the White Mountains to the northwest. The low hills in this region are covered with glacial drift, or are drumlins, composed of glacial till.

The Maine sea coast also varies in its physical characteristics. It is a complex physical environment consisting of low-land marshes, tidal mudflats, bays, channels, rock islands, and promontories. These conditions impart an extreme irregularity to the coastline so that its total length is more than 10 times the distance from Kittery to Eastport.

The present configuration of the Portsmouth Naval Shipyard is a result of expansion by landfilling outward (i.e., the connection of Jamaica and Dennett's Islands with Seavey Island). Therefore, although the Seavey area is a relatively flat land mass, it does have some minor topographic variability. In general, elevations at the Shipyard range from 10 to 20 feet above high water.

4.3.2 Climatology. The overall climate in the Portsmouth region is characterized as variable. Weather conditions can change dramatically over short intervals, such as alternating frontal systems on a day-to-day basis, widely-ranging diurnal and annual temperatures, and overall differences between the same seasons in different years.

Although this region is situated in the path of the prevailing westerly winds, the coastal area experiences a variety of air inversions over the course of a year. These include: cold dry artic air from the north, warm land air from the Gulf states, and cool, damp air from the Atlantic Ocean. It is the combinations of, or switches between these conditions that generally cause the area's characteristic weather.

Weather conditions, especially temperature, in the Portsmouth general area are moderated by its maritime setting. The average daily temperature ranges from 80°F in July to 13°F in January and February. Temperatures can fluctuate outside this range, but they are not usually persistent.

Precipitation is fairly evenly distributed over the year, with 2.7 to 4.6 inches falling per month for a 42.6-inch annual total. On the average there are about 130 days each year having more than a trace of precipitation. Most summer precipitation results from showers and, infrequently, thunderstorms. Winter precipitation is generally associated with stormy conditions caused by air masses moving up along the coast. Heavy precipitation events are usually caused by storm centers that form along the east coast and move northeastward through the New England area.

The cool Atlantic waters can produce extensive advection fog when warmer moist air is carried over the cool water. With any persistent eastern component in the wind direction, the fog that often lies just offshore during the summer can reach the coast line. This situation is increased during the summer by local sea breezes. All months of the year have a fairly consistent occurrence of fog. Localized and continuous fog is observed at Pease Air Force Base an average of about 15 percent of the time and is dense enough to restrict visibility to 1.2 miles (2 km) or less, about 3.5 percent of the time.

The predominant wind direction for the Portsmouth Harbor area is a combination of the western, southwestern, and southern sectors for a combined total of 51.5 percent of the time. Differences in wind characteristics occur on a seasonal basis with west-northwest winds dominating in the winter, and southwest-southeast winds increasing in frequency during spring and summer.

The wind speed averages 8.8 miles per hour in the Portsmouth Harbor area. Speeds greater than 40 miles per hour, however, can occur any time of the year. During the winter, increased wind speeds are normally caused by the northeast winds moving down the coast, while during the summer high winds are more often associated with thunderstorms or squall lines moving through the area.

4.3.3 Geology and Soils. The bedrock under the Portsmouth Naval Shipyard is principally of the Kittery Formation, a metamorphosed sedimentary rock of Silurian age. It is a fine-grained, lime-silicate, granofels consisting of calcareous sandstone, siltstone, and graywacke. The Portsmouth Fault, which is the contact between the Kittery and Rye Formations, is reported to reach from New Hampshire to the southeastern end of the Shipyard.

The geological character of the Shipyard and vicinity has been greatly influenced by glacial activity. Glaciation has tended to smooth out bedrock topography. Weathering and glaciation processes are also responsible for the deposition of till over most of the bedrock surfaces.

Typically, much of this coastal area has a shallow thickness of "overburden." The depth-to-bedrock over much of the area is 0 to 10 feet. A limited drilling program conducted in 1977 determined that the natural overburden was about 3 to 15 feet thick. Dredging and landfilling activities have increased the overburden throughout most of the Shipyard.

The naturally-occurring soil material at the Shipyard is classified as Lyman fine sandy loam. Over the years, much of the Shipyard has been built up by landfilling with a variety of materials, including dredge spoils. A soil-boring program was conducted in the Jamaica Island area of the Shipyard. It revealed a natural substratum of medium to soft clay beneath 15 to 20 feet of fill. The clay itself overlies a dense till 3 to 15 feet thick, underlain by bedrock.

4.3.4 Hydrology and Migration Potential.

4.3.4.1 Regional Hydrological Conditions. Because it is a coastal area, Portsmouth has a complex hydrological environment. There are three ecologically-distinct environments based on the salinity of the water, as follows:

(1) The marine ecosystem with a relatively high salt content.

(2) An estuarine ecosystem, the salinity of which is highly variable depending on the tidal state and precipitation.

(3) A freshwater ecosystem with very low salinity.

The marine ecosystem probably begins in the vicinity of the Shipyard and goes eastward into the Atlantic Ocean. The estuarine ecosystem abuts the marine ecosystem and reaches inland into Great Bay. The boundary between the two is indistinct and dependent on freshwater input and tidal flux. The freshwater ecosystem is entirely in the stream regime that feeds the bays and estuaries. The boundary between the estuarine and freshwater ecosystems is also indistinct for the same reasons.

The harbor is in the marine ecosystem. The deepest part of the channel is 78 feet at mean low water (MLW), and the shallows are 50 feet MLW. The tides are semi-diurnal (two in a lunar day of 24.84 hours) and vary in amplitude from 8.5 feet at Fort Point to 7.5 feet at Atlantic Height. At the Shipyard spring tides average 9.2 feet. The average flood currents range from 1.5 knots to 3.0 knots south of the Shipyard, and ebb currents run 2.0 knots to 3.8 knots.

4.3.4.2 Surface Runoff. Because it is a small highly-developed island the Shipyard has very little natural surface runoff. An extensive stormwater collection system has been constructed at the Shipyard, and most surface runoff is conveyed through the storm system to specific outlets into the Piscataqua River. Two natural ponds drain the open area in the southern portion of the Shipyard. A drainage outlet has been constructed from the ponds to the Piscataqua River.

4.3.4.3 Groundwater. There is no groundwater development at the Shipyard since the town of Kittery supplies potable water through two 12-inch mains.

Groundwater levels on those portions of the Shipyard that were the original islands (Seavey and Dennett's Islands) are reported to be relatively shallow. Glacial outwash sands and gravels form these unconfined aquifers. Much of the Shipyard (90 acres), however, was formerly an intertidal area and the depth to groundwater is equal to the depth of fill. This varies from approximately 13.5 feet at mean low water to 5.5 feet at mean high water.

4.3.4.4 Migration Potential. The migration potential for contaminants is discussed specifically for each disposal site in Chapter 8. Both surface and subsurface migration pathways exist at the Shipyard. The receptors of concern are the Piscataqua River and the biota that exist in the nearshore areas.

4.4 BIOLOGICAL FEATURES.

4.4.1 Terrestrial Characteristics. The Portsmouth Naval Shipyard is situated at the mouth of the Portsmouth Harbor in the Piscataqua River estuary. Like all estuarine environments there is some overlap between terrestrial and aquatic components. For example, the avifauna in this area are primarily waterfowl that include both aquatic and dry land areas in their range. The degree of overlap for other biological components, however, is related to shoreline conditions. Shorelines in the Portsmouth Harbor area are a mixture of steep, rocky banks and low-lying marshlands. The tidal marshlands contain ecologically-important habitat, while the intertidal area along the rocky banks tends to be limited to a vertical zonation along the rocks. In this area the steep interface between shoreline and inland areas reduces vegetation zonation, making it possible for dry-land species to exist in close proximity to the shorelines.

The Portsmouth harbor is in the Acadian Province, an area characterized by well-developed algal and boreal biota. The inland area is classified as a northern hardwoods/spruce forest.

Terrestrial wildlife in this area includes species common to northern forested areas, e.g., white-tailed deer, fox, and raccoon. Their abundance and distribution are controlled by the amount of development in the area. None of these species is present on the Shipyard property, however.

An outstanding biological feature of the Portsmouth Harbor area is its avian population. The Bay is a major wintering area for large numbers of waterfowl. It is reported that about three-quarters of all waterfowl wintering in the State of New Hampshire do so in this estuary. Although the heaviest populations occur in the winter, this area is used by some avian species during all parts of the year. Undeveloped areas serve as rookeries for birds, such as gulls, while mudflats around the islands provide feeding areas.

The Shipyard is a highly-developed, industrial property, with limited vegetative growth. Most of its ground cover consists of landscaping plants, with only scattered remnants of naturally-occurring species. Because of its general lack of habitat, and the heavy human and industrial activity, the Shipyard is unattractive for most species of wildlife. Some small mammals, however, have been seen, including mice and raccoons. Some gulls and passerine birds also appear on the property occasionally.

Clark's Island, a small undeveloped land mass east of the Shipyard, supports some biological resources. The vegetation here is composed primarily of herbaceous and shrub species such as rushes, jewelweed, skunk cabbage, spike grass, swamp azalea, bittersweet, witch hazel, and dogwood. There are also scattered low-land tree species, red maple, sycamore, willow, and poplar growing over the island. Appendix A provides a listing of flora indigenous to this area.

Because Clark's Island is basically a field/meadow environment it provides habitat for a variety of small mammals such as mice, raccoons, and opossum. Its greatest use, however, is as a wintering and nesting area for a large variety of waterfowl. In addition to numerous seagulls, Canadian geese, black duck, greater scaup, and lesser scaup are the most common species. There are also some passerine birds and, to a lesser extent, raptors use the island during other parts of the year. Appendix B lists the typical wildlife species that occur in the general area of the Shipyard, including avifauna species.

4.4.2 Aquatic Characteristics. The Portsmouth Harbor area affords a variety of aquatic habitats. The harbor's physical conditions, coupled with the tidal influence, lead to local variations in substrate composition, salinity, water depth, and current velocity. Habitat variability also extends into low-lying intertidal areas that include mudflats, marshlands, and rock-littered shallows.

Benthic investigations, as part of a dredging study in 1976, revealed differences in faunal communities with respect to substrate characteristics. The soft-bottomed harbor areas were found to have the greatest species diversity. These areas were dominated by starfish, sand dollars, barnacles, gastropods, amphipods, polychaetes, mussels, and a number of clams. The hard substrates are inhabited by hydroids, bryzoans, gastropods, barnacles, and mussels. These areas also support a variety of macroalgae such as Ascophyllum, Fucus,

and Laminaria. Lobsters, a commercially-important species, and several genus of crabs (Cancer, Carcinus, and Cagurus) occur in both soft- and hard-bottomed areas.

Fish communities in the Portsmouth Harbor area include both resident and migratory species. Common residents include flounders (winter, smooth, windowpane, and possibly yellowtail), Atlantic cod, sculpins (shorthorn and longhorn), sea raven, hakes (red, white, and silver), ocean perch, dogfish, skate (little clearnose and barndoor), pollock, and cunner. Another fish, the shortnose sturgeon, has also been identified as a resident of this estuarine system. Studies to date, however, have only encountered one individual in 1971.

Migratory fish use this area as both a zone of passage by anadramous fish and as seasonal habitat by other species. Anadramous migrations generally occur from mid-April through mid-June and from mid-August through mid-November. Smelt, silversides, and blueback herring pass through this area seasonally.

Striped bass, although classified as an anadramous species, are considered summer residents of this area. Coho salmon, which are not native to the area, have recently been introduced into this estuary as part of an experimental program.

Seasonal migrants to the Portsmouth Harbor area include American sandlace, Atlantic mackerel, bluefish, Atlantic menhaden (summer residents), and Atlantic herring (winter residents). A complete list of fish native to the Portsmouth estuarine and coastline areas is given in Appendix C, which includes a representative list of benthic infauna by substrate.

4.4.3 Rare, Threatened or Endangered Species; Critical Habitats. The State of Maine has not made any state designation of rare, threatened, or endangered animal species beyond those contained on the Federal list. Several of these species may be present in the state, at least seasonally. Except for reports of shortnose sturgeon (*Acipenser brevirostrum*) being present in the Portsmouth Harbor area, no threatened or endangered species are known to inhabit the Portsmouth Naval Shipyard. The Shipyard is not included in the critical habitat of any of these species.

The State of Maine has a floral protection program (Critical Areas Program) geared toward the protection of rare or significant floral species and their habitat throughout the state. None of these species is reported in the Portsmouth Shipyard area. Appendix D lists the endangered and threatened species in Maine.

4.5 FACTOR AFFECTING WATER QUALITY AND BIOTA.

4.5.1 Water Quality. The Portsmouth Naval Shipyard is located on an island in Portsmouth Harbor. The Harbor itself is the mouth of the Great Bay estuary where it enters the western Gulf of Maine. The Great Bay estuary is

morphologically complex, consisting of seven river valleys that join to form the Piscataqua River. As a result, water quality in the area is affected by an extensive drainage area of variable land use. The regional development of the Great Bay estuary can be characterized by its contributing states. The New Hampshire region is developed as several small manufacturing cities with low-density rural residential development interspersed. The Maine portion of the estuary is more rural, and supports more agricultural activity and less industry. Local development reflects high density uses along the waterfront in the Town of Portsmouth, New Hampshire. Across the Piscataqua River from Portsmouth, the Town of Kittery, Maine exists as a low-density residential community (Parsons et al., 1978).

4.5.1.1 Tides and Tidal Currents. Tides in Portsmouth Harbor are characterized as semi-diurnal with a mean tidal amplitude in the vicinity of the Shipyard of 8.1 feet. During spring tides, the difference in tidal elevation is approximately 9.3 feet. Tidal currents in Portsmouth Harbor are primarily a response to changes in tide height between the high and low tidal phases. The average flood currents in Portsmouth Harbor range from 1.5 to 3.3 knots, and average ebb velocities range from 2.0 to 3.8 knots. The mean tidal current patterns associated with ebb and flood tides for Portsmouth Harbor are presented on Figure 4-4. Current patterns are typically quite variable because of the complex geometry and bathymetry associated with Portsmouth Harbor (Parsons et al., 1978).

4.5.1.2 Flushing. Estuarine flushing denotes the composite processes whereby the water within the estuary is renewed, both through freshwater inflow and through exchange with the waters of the adjacent coastal area. The flushing rate is generally defined as the time required to replace a stated percentage of water within the estuary (Lauff, 1967). Studies conducted in the vicinity of the Shipyard computed flushing rates for contaminants released into the waters ranging from 6 to 12 tidal cycles, depending on the extent of freshwater flow and the location of the discharge. In general, the greater the freshwater flow the shorter the renewal time (Parsons et al., 1978).

4.5.1.3 Water Quality Characteristics. The waters surrounding the Shipyard are Class SB-1 (Maine Water and Air Environmental Improvement Commission Revised Statute of 1964, Effective October 1975). This classification requires water to be suitable for water contact recreation and fishing (Parsons et al., 1978).

4.5.1.3.1 Water temperature is a response to the annual cycle of atmospheric temperatures and, as a result, varies seasonally. The average annual water temperature is approximately 47.5°F with the maximum mean monthly temperatures (61.2°F) occurring in August. Minimum mean monthly temperatures (32.9°F) generally occur during February (Parsons et al., 1978).

4.5.1.3.2 The Maine Department of Environmental Protection has established standards for Class SB-2 marine waters that allow dissolved oxygen to fall below 6.0 mg/L only under natural conditions.

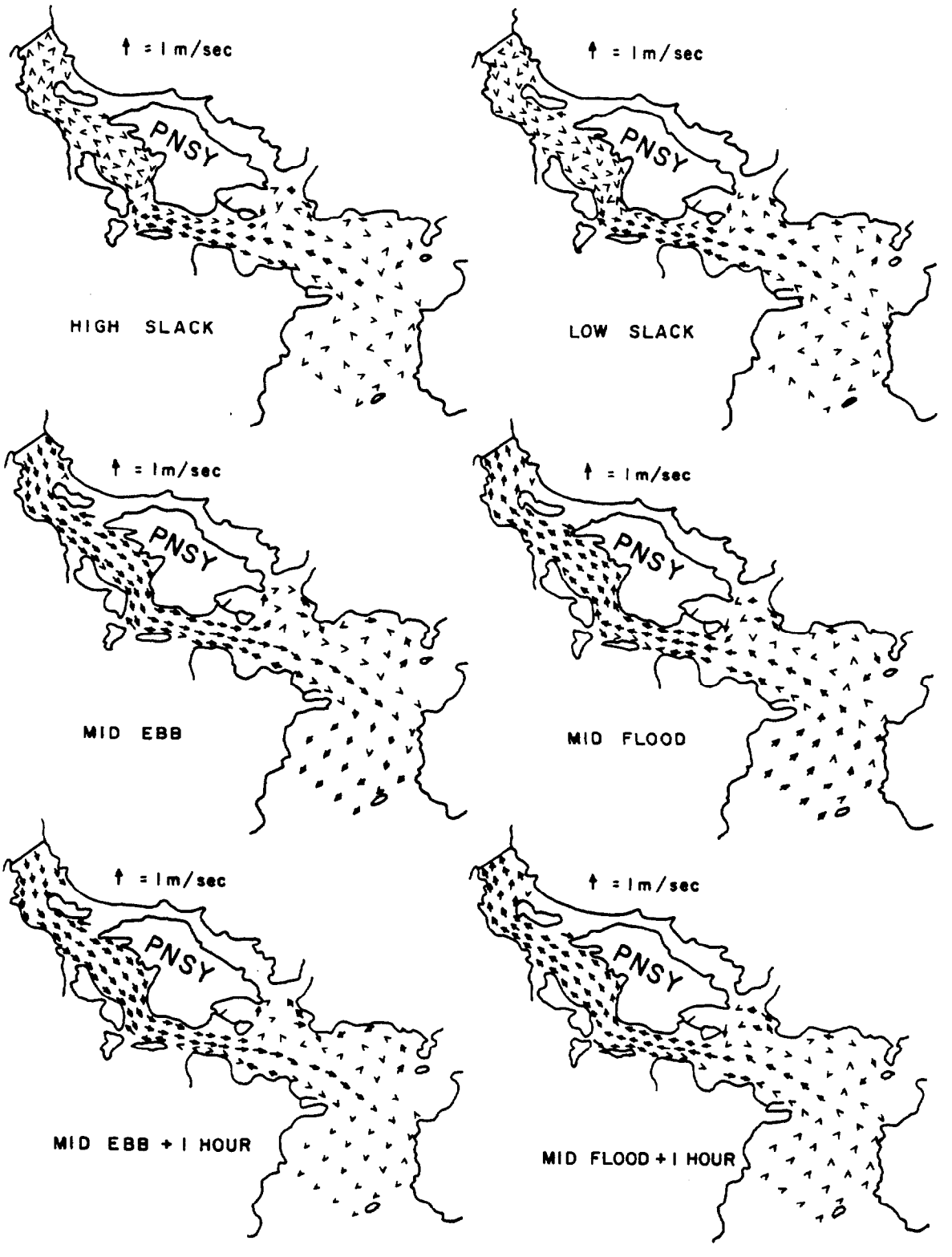


FIGURE 4-4
VECTOR PLOT OF FLOW PATTERNS FOR AVERAGE FLOW CONDITIONS PORTSMOUTH HARBOR

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL SHIPYARD

Seasonal variation of dissolved oxygen is evident in the estuary as a whole. Oxygen content is typically high during late fall, winter, and spring, ranging from 9.0 mg/L in October to 11.3 mg/L in April. Summer profiles (7.9 mg/L in August) reveal characteristic loss of oxygen as biological and chemical processes remove oxygen from the water column. Nevertheless, dissolved oxygen concentrations in Portsmouth Harbor generally remain near or above 100 percent saturation throughout the entire year (Parsons et al., 1978).

4.5.1.3.3 The salinity of Portsmouth Harbor is typical of coastal and estuarine waters in the Gulf of Maine. The salinity varies seasonally in response to the amount of freshwater discharged into the Great Bay estuary. Highest salinities are recorded during the fall with a mean monthly value of 30 parts per thousand (ppt). Salinity is lowest during the spring (26.1 ppt), reflecting the peak freshwater discharge. Vertical salinity stratification also varies temporally. Maximum stratification occurs during the peak discharge periods of March through May, while minimal stratification is generally observed from August through October (Parsons et al., 1978).

4.5.1.3.4 The pH in Portsmouth Harbor typically ranges from 7.1 to 8.0. Values are generally low during spring and increase in late summer and early fall. State standards for Class SB-1 waters are 6.7 to 8.5 (Parsons et al., 1978).

4.5.1.3.5 The quality of waters suitable for water contact recreation and fishing is measured by the number of total coliforms and fecal coliforms present per 100 ml of water. The statute requires that for an SB-2 nonshellfishing area, "the median number of fecal coliform bacteria in a series of samples representative of the waters shall not exceed 50 counts per 100 ml." Prior to dredging operations at the Shipyard in 1978, sediments analyzed for bacteria indicated fecal pollution in the sediments in the vicinity of Berth 13. This was generally believed to be the result of insufficient wastewater treatment of live-in barges moored in this area. Bacteriological testing has not been performed since the dredge operations were concluded.

4.5.1.3.6 Extensive testing for chemical contaminants in the sediments surrounding the berthing areas of the Shipyard was performed prior to dredge operations in 1978. Sediment samples were analyzed for 19 parameters that included PCBs, oils, greases, and six heavy metals. Results indicated that concentrations of copper, lead, zinc, and mercury were especially high for several stations. It is generally believed that these high levels are probably the result of operations at the Shipyard involving printing, fueling, soldering, etc. In addition, the concentration of PCBs in the vicinity of Berth 11 was significantly higher than that reported for the coastal waters of Maine (Parsons et al., 1978).

Sediment sampling for chemical contaminants in this area has not been performed since the dredging operations were concluded in 1978.

4.6 WATER SUPPLY.

4.6.1 Potable Water System. The Shipyard obtains potable water from the Kittery Water District through two 12-inch feeders. The Shipyard uses an average of 2.5 mgd, which is distributed to the facilities on the base through a distribution system that is considered to be in good condition. The Shipyard maintains an elevated storage tank with a capacity of 1 million gallons, and two standby pumps with capacities of 1,500 gpm and 2,500 gpm. These pumps are primarily intended for fire protection and to boost the system during low-pressure periods in the Kittery Water District.

The District treats and chlorinates the water supplied to the Shipyard. Tests for residual chlorine and coliforms are performed by the Preventative Medicine Officer and the Industrial Hygiene Department on a weekly basis. There have been no significant contamination problems of record at the Shipyard in the potable water system.

4.6.2 Industrial Water Supply. Most shops at the Shipyard use water from the potable water system for process and manufacturing purposes. A nonpotable system supplies salt water for cooling, flushing, and fire protection to Berths 6, 11, 13, and the dry docks.

4.7 ADJACENT LAND USE.

4.7.1 Land Use. The Naval Shipyard is located in Kittery, Maine, about 1 mile zortheast of Portsmouth, New Hampshire, on the north side of the Piscataqua River. The countryside north of Kittery consists of forests and some farm land. There are three communities, Rochester, Dover, and Sanford that contain approximately 25,000 people and are primarily industry towns with one or two industries (i.e., originally developed around a shoe or textile industry a century ago and have changed only moderately within the last few decades).

The area west of Kittery includes the college town of Durham, site of the University of New Hampshire with approximately 15,000 students; Pease Air Force Base; and a large body of water identified as Great Bay. To the southwest is more farm land and scattered, small communities (with populations ranging from several hundred people to less than 3,000), and the site of Exeter Academy.

Along the coast, south of Portsmouth, are beach communities, including Hampton with a population of 8,000. Hampton also has a considerable number of seasonal dwellings, 2,500 of which are substandard according to the Regional Planning Commission. Major industries in the area include the National Gypsum Company, Avery Agency (manufacturer of parts for nuclear reactors), three power plants, and gas storage facilities consisting of five tank farms.

4.7.2 Major Population Centers. The City of Portsmouth, New Hampshire, located south of the Shipyard at the mouth of the Piscataqua River is the largest city in the region, having a population of over 25,000. The pattern of high density along the waterfront reflects its early development and the importance of the waterway.

Today Portsmouth serves the region as a major retail and wholesale trade center. The city has developed industrially over time, at first because of its location on the Piscataqua River and more recently because of its transportation network. Pease Air Force Base in the western part of the City accounts for approximately 20 percent of Portsmouth's land area.

Located across the Piscataqua from Portsmouth is the town of Kittery, Maine. Kittery is predominantly a low density residential community of approximately 11,000 people. Kittery, the very essence of old New England, possesses a quiet, colonial charm that has been carefully preserved.

4.7.3 Upstream Land Use. Upstream of the Piscataqua River and its tributaries, the New Hampshire region has developed as several small manufacturing cities with low density rural residential development interspersed.

The cities of Dover, Somersworth, and Rochester, with populations of approximately 21,000, 9,000, and 18,000, respectively, are located 10 to 15 miles northwest of Portsmouth. These cities serve as major employment areas for the residents of the region. The main campus of the University of New Hampshire is located approximately 10 miles from Portsmouth in Durham.

The Maine region north of the Shipyard has a more rural setting than New Hampshire. Biddeford, located on the coast, and Sanford, located inland, are the major industrial and retail centers. Agricultural activities, scattered throughout the area, add to the economic activity of the region.

Several forts of historic value line the entrance to the harbor (Forts Constitution, McClary, Foster, and Stark). These sites are owned by the state or town in which they are located and are dedicated to passive recreation. Figure 4-5 shows the generalized land use in the region surrounding the Shipyard. As shown the predominant land use is low- and high-density residential land.

4.8 LEGAL ACTIONS.

4.8.1 Previous Hazardous Waste Disposal. For a number of years the Shipyard had a contract with Keefe Environmental Services of Epping, New Hampshire to haul chemical wastes to an off-base storage facility where the contractor reclaimed some of the solvents and sludges. The owner filed for bankruptcy and abandoned the facility in 1980. The New Hampshire Department of Environmental Protection notified the Shipyard and 160 other industrial generators that they must take the responsibility for properly disposing of their wastes. The Shipyard complied with this order and paid over $100,000 to dispose of 168 drums and 1,500 5-gallon cans of waste material. The Federal EPA became involved in 1982 and stated that the Shipyard and other major generators were still responsible for additional remedial action measures such as groundwater monitoring and other closure activities. Negotiations are currently in progress between the EPA, the Shipyard, NAVFAC, and other major generators concerning the financial requirements necessary to release the generators (including the Shipyard) from further liability at the Keefe site.

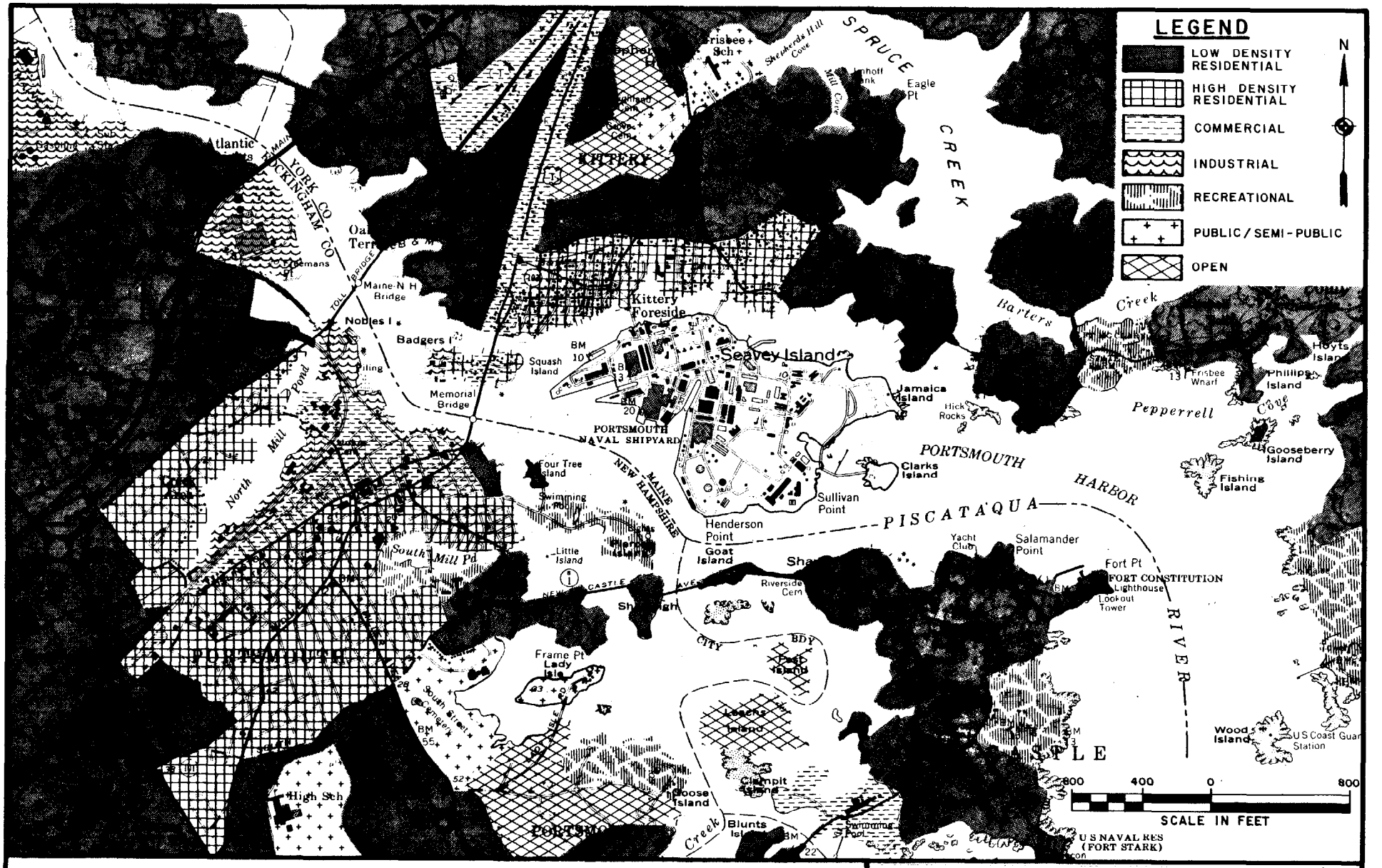


FIGURE 4-5

REGIONAL LAND USE

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

CHAPTER 5. WASTE GENERATION

5.1 GENERAL. As noted in Chapter 4, the Portsmouth Naval Shipyard encompasses the variety of industrial and manufacturing activities needed to support the Shipyard's mission of overhauling, repairing, and converting nuclear submarines. Brief descriptions of the shops that handle or generate hazardous materials or wastes are presented in this chapter. A summary of the wastes generated by each shop is shown in Table 5-1. All of these wastes are now properly handled in accordance with the Shipyard's Hazardous Waste Management Plan.

5.2 INDUSTRIAL OPERATIONS.

5.2.1 Shipfitter Shop.

5.2.1.1 Location. The Shipfitter Shop, Shop 11, is physically located in Building 92. This shop performs major shipbuilding operations associated with overhauling and refitting submarines. The major production activities include work on the hull, major foundations, and heavy structural steel construction.

5.2.1.2 Case-Hardening Tank. Sodium cyanide in the solid state is used in hardening various steel components. The cyanide is placed in a melting tank and heated until it is liquid. The steel components are dipped in the tank. In between use, the cyanide remains in the melt tank as a solid. No wastes are generated from this process; solid sodium cyanide is added periodically to replace evaporative losses.

5.2.1.3 Metalworking Operations. Approximately 155 gallons per year of cutting oils are consumed in shop operations each year. Small quantities of trichloroethane are used in cleaning and degreasing metal surfaces. Most of the trichloroethane is lost to evaporation and the remainder constitutes an annual waste volume of 30 gallons per year.

5.2.2 Sheet Metal Shop.

5.2.2.1 Location. The Sheet Metal Shop, Shop 17, is located in Building 75. This shop manufactures products from sheet metal for use on submarines and elsewhere. These products include items such as doors, ventilation ductwork, panels, light decking, and instrument housings, and are constructed of materials such as steel and aluminum.

5.2.2.2 Metalworking Operations. This shop conducts metal surface-cleaning operations that make use of acid and alkaline baths and rinse tanks. The acid and alkaline baths are periodically drained to a 695-gallon tank located underground between Buildings 75 and 44. Solid residues in the bottom of the bath and rinse tanks are also washed down into this tank. The underground tank is pumped out into a Shipyard tank truck for delivery to and treatment by the industrial wastewater treatment plant. The acid wastes represent a monthly volume of 2,000 gallons, while 800 gallons of alkaline wastes are generated monthly. Small quantities of hydraulic and cutting oils are occasionally spilled in the course of metalworking operations and are cleaned up with sorbent material. Approximately 20 pounds per month of oil-contaminated sorbent is generated in this manner.

Table 5-1

Hazardous Waste Generation,
Portsmouth Naval Shipyard

Shop	Building	Waste	Quantity (Monthly unless otherwise specified)
X-17	75	Acid and rinse	2,000 gal
	75	Alkali and rinse	800 gal
	75	Oil contaminant sorbent	20 lb
X-03	72	Degreaser (dry cleaning solvent)	5 gal
	72	Water treatment tank solids	10 lb
	72	Sorbent	210 lb
X-51	240	Trichloroethylene/detergent	825 gal/yr
	240	Vanguard stripping solution (WS-126)	200 gal/yr
	240	Waste oils	25 gal
	240	Sorbent	10 lb
	240	MEK/acetone/alcohols/trichloroethane/ xylene	55 gal/yr
	240	Epoxy resin	20 gal
X-11	92	Tichloroethane	15 gal/yr
	92	Oil-contaminated rags	30 lb
X-67	238	Freon/Strip-Oxy/solvents	25 gal
	238	Paint contaminated rinse water	2,400 gal
	240	Ultrasonic rinsing solution	30 gal
X-07	44	Degreaser (dry cleaning solvent)	40 gal/yr
	44	Refrigerator oil	5 gal
	44	Waste oil	10-12 gal
	65	Paint wastes	80 gal
X-31	80/300	Waste cutting oil (Cimcool)	2,200 gal
	80/300	Waste cutting oil (Trimsol)	10 gal
	80/300	Waste cutting oil (Joncool)	10 gal
	80/300	Freon	350 gal
	80	Waste hydraulic oil (test table)	4,000-5,000 gal
	80	Waste hydraulic oil (No. 2100/2150)	70 gal
	80/300/24	Oil contaminant sorbent	210 lb
	80	Brush electroplating wastes	10 gal
	240	Chromium contaminated cleaning bath	60 gal
	96	Acid and rinse	1,000 gal
	96	Alkali and rinse	990 gal

Table 5-1
(continued)

Shop	Building	Waste	Quantity (Monthly unless otherwise specified)
X-17	18	Epoxy paint wastes	500 gal
	18	Thinners, xylene, waste paint (also in dry docks)	880 gal
	285	Waste thinner, solvents (also dockside at dry dock 3)	440 gal
	285	Sandblast grit	600 tons
	64	Paint waste	55 gal
X-38	174	Freon, degreasers	230 gal
	174	Test Freon	7,700 gal/yr[1]
	174	Asbestos waste	1 cu yd
	174	Sorbent	310 lb
	96	Acid	3,200 gal/yr
X-56	89	Trichloroethylene	55 gal/yr
	89	Acetone	110 gal
	155	Trisodium phosphate	1,000 gal
	155	Waste hydraulic oil	1,100 gal/yr
	155	Freon	4,600 gal
	155	Lithium bromide	300 gal/yr
X-64	60	Paint wastes	15 gal
	178	Waste asbestos insulation	80 cu yd/yr
X-99	174	Freon still bottoms	20 gal
X-06	74	Degreasers	5 gal
	74	Waste lubricating, hydraulic oils	300 gal
	74	Waste grease	10 lb
	74	Gear lubricating oil	5 gal
	74	Cutting fluid	10-15 gal/yr
	74	Hi-T Degreasol	30 gal
	74	Synthetic lubricating oil	50 gal
X-02	154	Waste oils, degreasers	530 gal

[1]Mostly recycled through X-99 Freon still.

Note: This table represents only wastes generated within the shop buildings, with noted exceptions. In addition, there are variable quantities and types of wastes generated in the dry docks. Flushing of various systems by Shops 56 and 38 generates approximately 20,000 gal/yr of acid and alkaline wastes, some containing metal chelate compounds. Steam generator chemical cleaning produces approximately 60,000 gal/yr of acid and alkaline wastes containing chelates.

5.2.3 Welding Shop. The Welding Shop, Shop 26, is physically located in Building 92, but shop personnel provide welding services to all shops at locations throughout the Shipyard. Very little waste is produced in welding operations and generally consists of scrap metal and insulating materials. These materials are nonhazardous and are transferred to the Defense Logistics Agency (DLA) for salvage.

5.2.4 Pipefitter Shop.

5.2.4.1 Location. The Pipefitter Shop, Shop 56, conducts operations at three principal locations, Buildings 89, 155, and 174. This shop performs all pipefitting operations for the Shipyard, including bending and welding tubing and piping of various metals, as well as flushing and cleaning various piping systems on the submarines.

5.2.4.2 Waste-Generating Operations. The Pipefitter Shop operates a vapor degreasing unit in Building 89, which makes use of trichlorethylene as the solvent. Most of the trichloroethylene is consumed through evaporative losses with fresh solvent added to make up the losses. A total of 55 gallons per year of residual solvent is disposed of through cleaning the degreaser unit. Prior to 1979, different operating procedures for this unit resulted in an annual disposal volume of 1,000 gallons of trichloroethylene. Approximately 1,300 gallons of spent acetone generated in degreasing miscellaneous parts at Building 89 is disposed of annually.

Metal surface-cleaning operations are carried out in a chemical cleaning facility in Building 155 equipped with a 4,000-gallon tank for collecting spills and dragout. This facility uses acidic and alkaline baths in degreasing and removing scale from various mechanical components. This shop also uses corrosive materials in cleaning various piping systems on board the submarines at dockside. Prior to 1975, spent baths and rinse waters were diluted and discharged into the river. After 1975, all corrosive wastes were transported to the Shipyard industrial wastewater treatment plant for pretreatment prior to discharge to the Kittery municipal sewer. These wastes currently represent an annual volume of 24,000 gallons.

Flushing and cleaning various submarine piping systems produce waste trisodium phosphate and lithium bromide solutions in annual volumes of 12,000 and 300 gallons, respectively. These materials are transferred to the treatment plant for processing. Large quantities of Freon, typically 4,600 gallons per month, are also generated in the course of these operations. The Freon is only lightly contaminated and is recycled through a distillation unit, operated by Shop 99 in Building 174, for reuse in degreasing applications at the Shipyard. Smaller quantities of waste lubricating and hydraulic oils, approximately 200 to 300 gallons of each annually, are generated in the course of these operations. Prior to 1972, the bulk of the oily wastes were also diluted in the storm sewer and the river. After 1972, all oily wastes were collected in drums and transferred to the underground storage tanks at Jamaica Island for offsite disposal.

5.2.5 Machine Shops.

5.2.5.1 Location. The Inside (Shop 31) and Outside (Shop 38) Machine Shops, are located in Buildings 80, 300, and 174. These shops also participate in the operation of a chemical-cleaning facility in Building 96. Operations conducted by the machine shops include milling, grinding, machining, and cutting various metals for use in fittings and mechanical equipment. The Inside Machine Shop (Shop 31) conducts its operations inside Buildings 80 and 300, while the Outside Machine Shop (Shop 38), is responsible for dockside operations and installation of machined parts in the submarines.

5.2.5.2 Waste-Generating Operations. Both shops use and maintain a metal surface-cleaning facility in Building 96, which generates waste acidic, alkaline, and rinse baths. Prior to 1975, these baths were discharged through floor drains to the river. After 1975, they were transferred to the industrial wastewater treatment plant by the Public Transportation Shop, Shop 02. The total annual waste volume from this area is 28,400 gallons. In addition, Shop 38 operates another chemical-cleaning facility in Building 174. This facility was constructed in 1980 and operations began in 1981; there is no history of disposal to the river or floor drains. All dragout and waste baths are directed to a 2,270-gallon tank under the street between Building 174 and Dry Dock 3, and from which the wastes are periodically pumped for transfer to the treatment plant by Shop 02. The annual waste volume generated in this facility is 12,000 gallons.

Shop 31 generates large quantities of waste cutting and hydraulic oils in Buildings 80 and 300. Hydraulic oil is used in maintaining the shop metalworking machinery and in a large pressure-testing table. Currently, these wastes constitute an annual volume of 81,500 gallons, and are transferred to underground bulk storage tanks at Jamaica Island by Shop 02.

Freon is used in degreasing operations in both machine shops, and 7,000 gallons of spent solvent is generated annually. This material is collected in drums and transferred to the hazardous waste storage facility by Shop 02, the Transportation Shop. In addition, Shop 38 uses large quantities of Freon in testing various systems. Approximately 7,700 gallons of spent Freon is generated annually, but this material is only lightly contaminated and is redistilled by Shop 99 for reuse in degreasing.

Shop 31 operated a large electroplating area from the 1940's until 1972 in Building 79. Wastewater and spent baths were dumped into floor drains that discharged to the river near Berth 6. Sludges and tank bottoms from this operation were disposed of with regular trash, which was removed by Shop 02. The aggregate quantity of waste solids over the period of operation was discontinued in 1972, and currently only a small brush-plating process is active. The process generates approximately 120 gallons of waste electrolytes and water that are disposed of in containers through the hazardous waste storage facility.

Solid wastes generated by these shops included oil and solvent-contaminated sorbent (6,240 pounds per year), small quantities of asbestos insulation material (12 cubic yards per year), and metal turnings and scrap. The scrap metal is transferred to the Defense Logistics Agency for salvage. The waste asbestos is transferred to a central collection dumpster for disposal on a special contract. The waste sorbent material is disposed of in "burnable" dumpsters.

5.2.6 Electrical Shop.

5.2.6.1 Location. The Electrical Shop, Shop 51, conducts operations in Buildings 240, 238, and 174. In addition, this shop operates from several barges in support of operations conducted in the dry docks or at the various berths. The Electrical Shop is responsible for repairing and replacing submarine electrical equipment and systems.

5.2.6.2 Waste-Generating Operations. The Electrical Shop uses several solvent mixtures in degreasing and wire-stripping operations. Parts to be cleaned or stripped are typically placed in drums of solvent and removed for final cleaning after an extended soaking period. Currently, these operations are conducted in Building 240 and generate the following annual volumes of waste:

Waste Stream	Annual Volume
Trichloroethylene/detergent solution	825 gallons
Acetone/methyl ethyl ketone/xylene/trichloroethane/alcohol mixture	55 gallons
Vanguard stripping solution	200 gallons

Waste epoxy resins and oils are also generated in annual volumes of 240 gallons and 300 gallons, respectively, in the course of refurbishing electric motors. These wastes are all placed in drums and transferred to the hazardous waste storage facility by Shop 02 for offsite contract disposal. The waste oils are transferred to the underground storage tanks at Jamaica Island for contract disposal. It should be noted that the actual consumption of solvents may be higher than the quantities of waste generated since the potential exists for large evaporative losses.

Shop 51 operates a battery repair and decommissioning facility in Building 238. The operations at this location generate waste sulfuric acid, lead-bearing sludges, and lead-plate battery elements. Prior to the construction of an underground storage tank in conjunction with the treatment plant in 1975, waste battery acid and lead sediment and sludges were discharged directly to the river. These wastes are currently collected in a 9,000-gallon underground tank by a floor drain system. The tank is periodically emptied by Shop 02 and the wastes processed at the treatment plant. Approximately 3,300 gallons of these wastes have been generated annually for the past 30 to 40 years. The lead plates have always been and are currently sent to the Defense Logistics Agency for salvage. Approximately 55 tons of these waste elements have been generated annually for the past 30 to 40 years.

5.2.7 Electronics Shop.

5.2.7.1 Location. The Electronics Shop, Shop 67, is located in Buildings 238 and 240. This shop also operates a transducer repair and servicing facility in Building 306. The transducer repair facility was located in Building 238 until constructon of Building 306 was completed in 1981. The Electronics Shop is responsible for repairing and servicing electronic instruments and peripheral equipment for the submarines serviced at the Shipyard.

5.2.7.2 Waste-Generating Operations. A mixture of Freon, Strip-oxy, and other solvents such as acetone and trichloroethylene, are used in Building 238 to strip insulation, coatings, and grease or oil from fittings, and equipment parts. This operation generates 300 gallons per year of waste solvent mixture, though actual consumption is higher because of evaporative losses. The stripping wastes are placed in drums and transferred to the hazardous waste storage facility by Shop 02.

The transducer repair facility in Building 306 periodically generates paraffin-based liquid wastes when transducer fluids are replaced. The annual volume generated is uncertain since the material in use is new. The initial order was for 660 gallons since this is the currently anticipated annual usage.

5.2.8 Service Shops.

5.2.8.1 Location. The Service Shops, Shops 06 and 99, are based primarily in Building 74. Shop 99 provides shore-to-ship connections and services to the dry docks and berths, including electricity, steam, compressed air, and sanitary sewer. Shop 06 provides services to shore industrial operations, primarily in maintaining production machinery and equipment.

5.2.8.2 Waste-Generating Operations. The major function of Shop 06 is regular maintenance and repair of various pieces of heavy mechanical equipment in use in industrial operations. These activities generate waste lubricating and hydraulic oils at an annual rate of 4,300 gallons. The waste oils are transferred to the underground storage tanks at Jamaica Island by Shop 02 prior to contract disposal. Cleanup of tools and equipment results in the generation of 420 gallons per year of chlorinated degreasing solvents that are transferred to the hazardous waste storage facility prior to offsite disposal.

Shop 99 operates the Freon distillation unit in Building 174. This 40-gallon per hour unit reclaims lightly-contaminated Freon from various high purity cleaning and testing operations for reuse in degreasing applications. The still generates 250 gallons per year of still bottom wastes that are collected in drums and transferred to the hazardous waste storage facility by Shop 02.

5.2.9 Paint Shop.

5.2.9.1 Location. The Paint Shop, Shop 71, is located mainly in Buildings 18, 64, and 285. This shop is responsible for painting both the inside and outside of submarines, therefore, there are small administrative offices located at dockside and on barges. Cleaning and flushing of bilges and tanks preparatory to preservative painting is also a major function.

5.2.9.2 Waste-Generating Operations. Epoxy resin-based paints were introduced in the late 1960's and are used extensively in painting operations at the Shipyard. The paints require mixing two components that react to form the epoxy paint coating when dried. These paints will generally harden or set by the end of a day, and consequently cannot be reused once mixed. Leftover paints are consolidated in several containers at the end of each day, allowed to harden, and disposed of offsite by contract. Currently, 6,000 gallons per year of these paints are generated.

Prior to the introduction of epoxy paints, substantial quantities of solvents were used in handling and cleaning up oil-based paints. The solvents, used from at least 1950 on, included methyl ethyl ketone and mineral spirits, with the addition of xylene in the mid-1960's. The annual waste generation rates for these solvents were 400 gallons, 200 gallons, and 300 to 400 gallons, respectively, though actual consumption was greater since there was significant informal recycling of waste solvents as thinners. These wastes were collected in drums and removed for disposal by Shop 02.

Currently, methyl ethyl ketone, ethylene glycol monoethylether, and xylene are used in thinning paints and cleaning up painting equipment and brushes in the three buildings and dockside. Wastes from Building 18, Dry Dock 2, total 4,800 gallons per year, while those generated at Building 285 and nearby docks total 2,400 gallons per year. In addition, 600 gallons per year are generated at Building 64.

Building 285 houses the sandblasting facility for removing paint from equipment and metal surfaces. In addition, sandblasting operations are conducted in the dry docks. Approximately 7,200 tons of spent sandblast grit are generated annually and disposed of offsite. Until 1980 this material was landfilled at the Jamaica Island spoils disposal area.

The Paint Shop operates the wheeler systems at dockside locations that are used to pump out the submarine bilges and various tanks that require cleaning. Wheeler wastes include acidic and alkaline cleaning solutions and oil/water mixtures. Oil/water mixtures are pumped into dumpsters that serve as crude oil/water separators. When the dumpsters become full of oil, they are emptied into the underground storage tanks at Jamaica Island. The rates of generation are dependent on the number of submarines serviced and the characteristics of a particular submarine and, therefore, are highly variable. Acidic and alkaline wastes are transferred to the treatment plant and constitute an average yearly volume of 6,000 and 8,000 gallons.

5.2.10 Shipwright Shop. The Shipwright Shop, Shop 64, is located in Building 45. This shop is responsible for constructing docking blocks and cradles, and is involved in laying planking and decking on scaffolding and staging in the dry docks.

Shop 64 also constructs scale models and mockups for various applications. Approximately 200 gallons per year of waste paint and solvents are generated in the course of mockup building activities. This shop is responsible for removing asbestos insulation from the submarines, and generates 80 cubic yards per year of this material as waste. Shop 02 transports the asbestos waste to a central collection dumpster north of the prison. The dumpster is periodically emptied by a disposal contractor. From the early to late 1960's, asbestos waste was disposed of in the Jamaica Island landfill.

5.2.11 Rigger Shop. The Rigger Shop, Shop 72, is located in Building 7. This shop is responsible for directing the movement of machinery and equipment on or off the submarines, and for setting up and maintaining the staging and scaffolding used in the dry docks. This shop also directs the operations of the mobile cranes used in dry-dock operations. Very little waste is generated by this shop (primarily 100 gallons per year of spent degreasing solvent used in cleaning mechanical parts, chains, and chain falls). The waste solvent is collected in drums and transferred to the hazardous waste storage facility by Shop 02 for offsite disposal under contract.

5.2.12 Transportation Shop. The Transportation Shop, Shop 02, is located in Building 154. This shop is responsible for operating, repairing, and maintaining all Shipyard vehicles, including the mobile cranes, and transporting waste materials to appropriate collection or transfer points. The wastes generated by this shop are produced in the course of maintenance operations and include waste lubricating oils, hydraulic fluids, and ethylene glycol (antifreeze). Until 1980, 900 gallons per year of ethylene glycol was disposed of into a storm sewer draining into the river. This waste stream is now collected in containers and transferred to the hazardous waste storage facility for contractor disposal. The waste lubricating and hydraulic oils are transferred to the underground storage tanks at Jamaica Island prior to contract disposal.

5.2.13 Utilities Shop. The Utilities Shop, Shop 03, is located in Building 72, the Power Plant. This shop is responsible for operating and maintaining the Power Plant and providing electricity, heat, high pressure air, and steam for industrial operations, as well as to administrative buildings. The Utilities Shop generates 2,500 pounds of oil-contaminated sorbent each year from the cleanup of small spills in and around the Power Plant. A small boiler feedwater treatment system generates 120 pounds per year of precipitated solids, and minor degreasing and metal parts cleaning operations generate 60 gallons per year of spent dry-cleaning sorbent.

The Utilities Shop has also been responsible for the operation of the industrial wastewater treatment plant in Building 298 since its completion in 1975. The treatment plant neutralizes acidic and alkaline wastewaters prior to discharge to the Kittery municipal sewer. A precipitation process generates approximately 50 cubic yards per year of a heavy metal hydroxide sludge that is disposed of offsite by a contractor.

5.2.14 Maintenance Shop. The Maintenance Shop, Shop 07, is located in Buildings 44 and 65. Shop 07 is responsible for maintaining and conducting repairs in the administrative, housing, and industrial buildings at the Shipyard. The shop maintains a staff of electricians, plumbers, and carpenters for this purpose. The wastes generated in the course of these activities include 180 gallons of waste oils per year and 1,000 gallons of painting and solvent wastes per year. Tool and equipment degreasing operations generate 40 gallons of spent dry-cleaning solvent per year.

The Maintenance Shop is also responsible for pest control programs. These programs have been very carefully managed for at least the past 15 years. Procedures include triple rinsing of all sprayers and collection and reuse of the rinse water in diluting the next batch of pesticides. Empty cans and bottles are rinsed and the rinse water collected for reuse prior to disposal.

5.2.15 Materials Testing Laboratory. The Materials Testing Laboratory, Code 137, is located in Building 20 and serves the Shipyard as an analytical chemistry laboratory. Only small quantities of hazardous chemicals are used for specific tests, and this Code does not generate any bulk waste streams.

5.2.16 Defense Logistics Agency. The Defense Logistics Agency (DLA), formerly the Defense Property Disposal Office, is a tenant facility at the Shipyard. The Agency's mission is to sell for salvage any off-specification materials, scrap, or excess materials. All such materials collected by the Shipyard are transferred to DLA for resale. Therefore, no wastes are generated by the on-site activities of this agency.

5.2.17 Printing and Photography Operations. The Print Shop, Shop 84, is located in Building 20 and is responsible for printing, photography, photocopying, and publishing activities in support of the Shipyard administrative and industrial operations. Shop 84 generates small quantities of wastes in conjunction with photography and photocopying activities, including developer, fixer, and toner compounds. This shop also generates 165 gallons per year of a tetrachloroethylene and petroleum naphtha mixture from cleaning reproduction and printing equipment.

The quality assurance program employs x-ray filming techniques in checking the quality of welds. These x-rays are developed by the Film Control Section, Code 133.12, in a process that generates silver-contaminated fixing solution. The fixing solution from the Shipyard photographer's laboratory is combined with the x-ray fixer, and the silver removed electrolytically prior to disposal of the fixer to the sanitary sewer.

The Shipyard Reproductions Section in Building 84 and the Clinic in Building H-1 use small ion-exchange columns to recover silver from the fixing solutions used in photographic reproduction and x-ray developing, respectively.

5.2.18 Medical Facilities.

5.2.18.1 Northeast Regional Medical Clinic. This Clinic provides out-patient health care services to military personnel and their dependents at the Shipyard. Infectious wastes generated at the Clinic are sterilized in an autoclave prior to disposal. Pharmaceutical wastes are crushed, dissolved, and flushed down the sanitary sewer. Waste x-ray fixer is processed through an ion-exchange column to remove silver prior to disposal to the sanitary sewer.

5.2.18.2 Dental Clinic. Precious metals from the Dental Clinic are salvaged. No hazardous wastes are generated at the clinic.

5.2.19 Fuel Farm. There are two major fuel storage areas at the Shipyard; the fuel farm consists of three large tanks southeast of Berth 6 and the diked fuel farm adjacent to the Power Plant, Building 72. The tanks southeast of Berth 6 were constructed in the early 1920's and are used to store fuel oil for Shipyard support vessels. The age of the tanks and associated piping has resulted in an increasing number of breakage, seepage, and leakage incidents. The most serious was a spill of 3,000 gallons from a ruptured underground pipeline at Berth 6 in 1978. The pipeline was excavated and sealed by a contractor.

The fuel farm at the Power Plant was constructed in the late 1970's to store oil to fuel the boilers. The supply of oil in the tanks is replenished by daily tanker truck deliveries.

5.2.20 Firefighting. The Shipyard Fire Department maintains one fire station that serves the entire installation. There is no open firefighting practice area.

5.3 ORDNANCE OPERATIONS.

5.3.1 Ordnance Handled. Ordnance handled at the Shipyard includes military pyrotechnics, solid propellants, small arms ammunition, fuse lighters, and distress signals. In addition, Poseidon gas generators are stored and used at the Shipyard. These materials are classified as Class 1.3 and 1.4 under the DoD Ammunition Hazard Class, which means they represent a fire hazard if handled improperly.

5.3.2 Ammunition Storage Area. The Jamaica Island magazine is designated as the area for storing ammunition. It is suitable for storing the Shipyard allowance of small arms ammunition and saluting charges, and limited amounts of small arms and pyrotechnics for submarines or other vessels that may have requirements for training and sea trials. It is also used for storing gas generators for further transfer to a submarine.

5.3.3 Explosives Safety Survey. The DoD Explosives Safety Board in Alexandria, Virginia has conducted annual surveys at the Shipyard for the last 5 years. The purpose of the surveys is to inspect conditions with respect to maintenance, disposal, handling, transportation, and storage of ammunition and explosives. No contaminated areas or improper disposal practices have been uncovered at the Shipyard during these surveys.

Due to the crowded conditions at the Shipyard, a number of waivers have been granted to the required Explosive Safety Quantity Distance (ESQD) arcs around the berths where ordnance is handled or transferred to the submarines in port.

5.3.4 Manufacturing and Loading. There is no manufacturing or loading of ordnance items at the Shipyard and no evidence that there ever were any such operations.

5.3.5 Demilitarization. There are no ordnance demilitarization operations at the Shipyard, and no evidence that there ever were any such operations.

5.3.6 Renovation. There are no renovation operations of ammunition or explosives items at the Shipyard, and no evidence that there ever were any such operations.

5.3.7 Ranges, Impact Zones. There are no test ranges, bombing ranges, or any type of impact zones for ordnance testing on the Shipyard or evidence of any such operations.

5.4 RADIOLOGICAL OPERATIONS. The Shipyard services submarines from the U.S. Navy's nuclear fleet. Propulsion systems for these submarines are highly classified and this discussion is, therefore, limited to nonpropulsion-related radiological operations.

5.4.1 Dial Shops. A watch and dial repair shop was in operation at the Shipyard from the late 1950's until 1975. The radiological waste generated included radium dials, radium paints, rags, brushes, titrated dials, and other similar materials. From interviews with staff from the Radiation Health Department it was determined that these wastes were disposed of offsite at approved disposal locations. Currently, ships dials are sent to the manufacturer for repair, replacement, or disposal.

5.4.2 Instrumentation Calibration Shop. Calibration of radiological instrumentation occurs in Shop 67. Only sealed radiation sources consisting of cesium-137, plutonium beta, plutonium alpha, and other check sources are used in this shop. These sources are regulated under a general NRC license to the Naval Electronics Command. Periodic tests of these sources have indicated that there are no leaks. There are no radiological wastes generated in Shop 67.

5.4.3 Other Sealed Sources. Other sealed sources at the Shipyard consist of static eliminators and cobalt-60 and iridium-192 industrial radiography units. The static eliminators are manufactured by 3M Company and are shipped back to 3M for repair, replacement, or disposal. The industrial radiography units are routinely leak tested and have been found to be secure. No radiological wastes are generated from these activities.

5.4.4 Medical Sources. To the best recollection of the Shipyard staff in the Radiation Health Department, there has been no medical usage of radioactive materials for diagnostic or therapeutic purposes. Only sealed sources were used in the laboratories.

5.4.5 Previous Disposal Practices. Radioactive wastes have typically been drummed and shipped by Interstate Corporation to the Norfolk Supply Depot in Norfolk, Virginia. From there these wastes are shipped offsite to an approved commercial disposal site. In 1981 Portsmouth generated 3,000 cubic feet of radioactive solid waste, which was primarily cobalt-60. From interviews with the staff of the Occupational Health Division it was determined that sometime in the past, probably in the late 1950's, materials used in a radiological environment, such as polyethylene bags, tape, and other "yellow" materials, were buried in the Jamaica Island landfill and in a small area adjacent to what is now known as Building 298. Apparently these materials were checked for radioactivity and found to be clean prior to burial. This practice apparently only occurred in the early years of the Shipyard's nuclear power program (1958 to 1960).

5.4.6 Radiological Surveys. Environmental monitoring is conducted by the U.S. Navy in all U.S. harbors frequented by nuclear-powered ships. The monitoring conducted at the Portsmouth Naval Shipyard consists of analyzing harbor water, sediment, and marine life samples for radioactivity. Samples are checked at least annually by a U.S. Department of Energy laboratory to ensure that analytical procedures are correct. Cobalt-60 is the predominant radionuclide added to the environment from Naval nuclear reactor operations. Therefore, Navy monitoring procedures required collecting approximately 20 to 120 sediment samples in each harbor once each quarter year for cobalt-60 and gross gamma analyses. The sampling locations were selected individually for Portsmouth, considering the configuration of the ship berths.

Results from the 1981 survey indicate that all samples contained less than three millionths of a microcurie of cobalt-60, comparable to the levels of naturally-occurring radioactivity such as potassium, radium, uranium, and thorium (Sjoblom, 1981). Selected samples of marine life, such as mollusks, crustaceans, and marine plants, have also been monitored at the Shipyard. No buildup of cobalt-60 has been detected in these samples.

CHAPTER 6. MATERIAL HANDLING: STORAGE AND TRANSPORTATION

6.1 INDUSTRIAL. There are numerous industrial activities at the Shipyard that handle hazardous materials. Many shops handle small quantities of these materials and only use them periodically. The Shipyard Supply Department is the initial receiving point for all hazardous materials.

6.1.1 Chemical and Hazardous Materials Storage. The Supply Department handles all new materials purchasing and storage for the Shipyard. Materials enter the supply system through one of the following three authorized routes:

(1) System stock
(2) Direct materials inventory (DMI)
(3) Blanket purchase agreements (BPA)

System stock consists of standard materials obtained through the Federal supply system. The DMI consists of nonstandard items purchased in quantity to meet special requirements of a specific end use. The BPA mechanism allows the Supply Department to purchase nonstandard materials from local suppliers to meet immediate, short-term production needs.

Two types of hazardous materials storage are maintained at the Shipyard; one main hazardous materials supply storage in Building 98, and shop stores at various locations. Hazardous materials stored in the shop stores are issued from the Supply Department's stocks maintained in Building 98. All items received in Building 98 are marked with Department of Transportation hazard labels prior to being placed in storage. Shop stores are maintained at individual shop locations throughout the Shipyard, and have been in existence approximately as long as each corresponding shop.

The locations of the shop stores are listed in Table 6-1. A summary of the hazardous materials that are stored in these shops, as well as in the main supply storage building (Building 98), is shown in Table 6-2. The typical annual quantity shown indicates that many of these hazardous materials are stored in relatively small quantities.

6.1.2 Defense Property Disposal Office. At the present time, the tenant DPDO does not have the storage capacity to handle the volume of hazardous materials generated by the Shipyard, and does not actually store or dispose of any of these wastes. The Defense Property Disposal Service (DPDS) has assumed only funding responsibility for the hazardous waste disposal contracts at the Shipyard.

The DPDO has stored lead cells from submarine batteries at the DPDO storage yard for over 30 years. The lead cells were stored until a reclaimer could haul them away for recycling.

The only hazardous materials storage managed by the tenant DPDO is off-spec chemical substances. These materials are stored in drums in Building 284, which is a DPDO holding area. The materials are normally resold and little actual disposal is necessary.

Table 6-1

Individual Shop Stores,
Portsmouth Naval Shipyard

Shop Stores	Location
02	Building 154
03	Building 72
07	Building 44
11	Building 92
17	Building 75
26	Building 92
31	Building 80
38	Building 174
51	Building 240
56	Building 155
64	Building 45
67	Building 240
71	Buildings 18, 285
72	Building 7
99/06	Buildings 7, 75, 80, 92, 96, 155, 174, 240, 291

Table 6-2

Hazardous Materials Stored at the Portsmouth Naval Shipyard

Hazardous Material	Typical Annual Quantity Used
Acetone, tech.	35 gal
Ammonia persulfate	43 lb
Ammonia hydroxide	4 gal
Arcon isocyanate	2 gal
Asphalt	155 gal
Copper solution	2 gal
Corrosion preventive compound	275 gal
Cleaning solvent, Type II	55 gal
Chemclean 126	55 gal
Cyclohexenene	2 gal
Dalic plating solution	19 gal
Diazinon (insecticide)	2 gal
Dichloromethane, tech.	110 gal
Dry-cleaning solvent	55 gal
Epoxy polyamide	110 gal
Etching solution	2 gal
Etching and activating solution	1 gal
Ethyl butanol	5 gal
Ethylene glycol	110 gal
Ethylene glycol monoethylene ether	5 gal
Ethylenediamine tetracetic acid	222 lb

Table 6-2
(continued)

Hazardous Material	Typical Annual Quantity Used
Freon cleaning agent	55 gal
Hydrazene solution	31 lb
Methanol, tech., Grade B	25 gal
Methylethyl ketone	85 gal
Monoethanolamine	660 gal
Morpholine, tech.	3 gal
Naptha aliphatic	5 gal
Paint slops	6,400 gal
Polyester resin	57 gal
Polyester/styrene	165 gal
Potassium tetraborate	1,850 gal
Plastisol coating	155 gal
Poly glycol, plasticized	55 gal
Resin	170 gal
Silver nitrate	12 oz
Silver solution	7 gal
Sodium sulfite	230 lb
Sodium hydroxide	160 lb
Sodium metasilicate chlorine	2,000 lb
Stripoxy	275 gal
Thinners, paint	145 gal

Table 6-2
(continued)

Hazardous Material	Typical Annual Quantity Used
Thiokol accelerator	1 gal
Toluene disocyanate	55 gal
Trichlorofluoroethane, tech.	55 gal
Versamide epoxy hardener	1 gal
Xylene	55 gal

6.1.3 Industrial Fluids and Gases. The Shipyard is required to use several kinds of industrial fluids and gases in overhauling the submarines. Some of the most significant of these systems are the propane gas system, the MAPP gas system, and the liquid nitrogen system.

6.1.3.1 Propane Gas System. There are two propane gas storage systems at the Shipyard. One of these systems is no longer in use.

The propane storage facility at Building 200 includes two storage tanks of 3,600 gallons each with a short run of 2-inch distribution piping. This system is no longer in use, however.

The only current use for propane gas is the bake ovens in Building 240. If these ovens could be converted to MAPP gas, the propane system could be eliminated. The feasibility of converting the bake ovens in Building 240 from propane to MAPP gas is being evaluated by the Shipyard.

6.1.3.2 MAPP Gas System. The MAPP (methyl acetylene propadiene) gas distribution system is considered to be generally in good condition; however, there are sections of old underground piping in use that have not been inspected and are in questionable condition. Several sections of the distribution system have been blanked off as requirements have been eliminated. The 2,000-gallon storage tank and supply facilities are owned by the supplier who is under contract to the Shipyard.

6.1.3.3 Liquid Nitrogen System. Liquid nitrogen is purchased and stored in a 1,500-gallon and a 3,000-gallon trailer, and in a 1,500-gallon storage tank. The nitrogen is taken by trailer truck to the shipboard test site and delivered to the submarines in either a gaseous or liquid state. The system is capable of delivering 12,000 standard cubic feet per hour of nitrogen at pressures up to 4,500 pounds per square inch gravity.

6.1.4 Petroleum, Oil, and Lubricants. The Shipyard has two 150,000-barrel fuel oil storage tanks (T1 and T2) located at the southern end of the base. In addition, two 60,000-gallon day tanks near the Power Plant (Building 72) are used as storage for fuel for the three 120,000-pounds per hour boilers located in the main Power Plant (Building 72). The Tank Farm area where the large storage tanks (T1 and T2) are located are bermed with earthen dikes.

Oil and lubricants enter the Shipyard through the Supply Department and are stored in Building 98. When requested by the shop stores, the drums are transported to the shop by the Transportation Department.

The waste oils generated from these shops include cooling and cutting oils, motor oils, transmission oils, and hydraulic oils. They are collected in dumpsters or drums, and transferred to two 7,000-gallon underground waste oil storage tanks at Jamaica Island. The waste oils are then removed by outside contractors for either recovery or disposal.

6.1.5 Coal Storage. Currently coal is not stored at the Shipyard. Oil is used as a primary fuel feedstock. There is a coal conversion plan that has been submitted to NAVFAC, however, no action or decision has been made as yet. The Shipyard's position at this time is that coal storage and handling at the present plant site is unacceptable due to disruption of industrial operations. The Shipyard recommends relocating the steam generating plant to the Tank Farm area and piping steam to the present plant site for electrical generation and distribution as appropriate.

The master plan has reserved the Oil Tank 1 site for coal storage, and new power plant as well. Use of the site as proposed requires the removal or relocation of several quarters. In addition, most of the DPDO open storage area would have to be relocated elsewhere. A potential site exists for a relocated DPDO storage area near and to the south of the ammunition storage area.

6.1.6 Polychlorinated Biphenyls (PCBs) Storage.

6.1.6.1 In-service PCBs. The Shipyard has numerous transformers in service and in storage throughout the facility. The transformers contain a coolant named INERTEEN ASKAREL, which has been found to contain PCBs. There are 19 transformers in service that contain a total of approximately 566 pounds of PCBs. The condition of these transformers is generally good.

6.1.6.2 PCB-Contaminated Transformers in Service. As of October 1982 the Shipyard had 14 transformers, in addition to the 19 transformers noted previously, which have been determined to be contaminated with PCBs. These are listed in Table 6-3.

6.1.6.3 PCBs in Storage. The Shipyard also has 23 oil transformers in storage, and has initiated a sampling and testing contract to determine which ones contain PCBs. The results of this survey were not available at the time of the onsite visit by the IAS team.

6.1.7 Storage Areas and Scrap Yards. There are a number of areas at the Shipyard that are currently used for storage of hazardous wastes and materials. These are indicated in Table 6-4. The location of these areas is shown on Figure 6-1.

6.1.8 Materials and Waste Transportation. The five major categories of wastes generated at the Shipyard require both on-base and offsite transport to commercial disposal facilities. The transportation method for each category is discussed in the subsections that follow.

6.1.8.1 Waste Oils and Degreasers. The Transportation Shop at the Shipyard picks up the dumpsters and drums of waste oils and delivers them to the underground storage tanks at Jamaica Island. A contractor pumps the waste oils into the contractor's tank truck and transports the wastes to offsite locations.

Table 6-3

PCB-Contaminated Transformers in Service,
Portsmouth Naval Shipyard

No.	Location	Manufacturer	Serial	KVA	PCB Concentration (ppm)
1	Welding House 3	Moloney	704485	75	880
2	MG 2 Transformer	West	SBV3403-0	750	250
3	Network 15	West	3152980	750	210
4	Station Services, Building 72	GE	7083328	750	380
5	Station Services, Building 72	GE	7085000	750	330
6	Station Services, Building 72 Switchboard	West	SBV0368-01	2000	320
7	Joy Air Compressor, Building 72	West	---	2000	65
8	Dry Dock 2 (Sub 7) Hotel	West	PAV0163-01	2000	150
9	Network 16	West	SBR27011	750	210
10	Network 22	West	XBR27012	750	140
11	Building 243 Test	GE	828574	125	280
12	Building 243 Test	GE	828573	125	220
13	Building 243 Test	GE	828575	125	190
14	Dry Dock 2 Hotel, Primary Switch		611-72-0567		104

Table 6-4

Hazardous Waste Storage Areas,
Portsmouth Naval Shipyard

Storage Area	Hazardous Wastes Stored	Type of Storage
Plate Yard	Paint wastes, solvents, miscellaneous chemicals	Drums
Building 55	Paint wastes, solvents, miscellaneous chemicals	Drums
Building 98	Mercury wastes	Drums
Unused roadway north of prison	Asbestos (waste insulation)	Double polyethylene bags in 30 cu yd roll-on body type container
Building 284	DLA holding area for off-spec materials prior to resale	Drums
Building 298 (industrial waste treatment plant)	Aqueous; acids, alkalis, and metal wastes	Fiberglass storage tanks
Jamaica Island	Waste oils	Underground tanks

6.1.8.2 Solvents, Paints, and Miscellaneous Chemical Wastes. These wastes are picked up by the Transportation Shop from the various industrial shops, and delivered in drums to the Plate Yard for temporary storage. The drums are transported offsite for either recovery, treatment, or disposal.

Chemical Recovery of Boston, Massachusetts is under contract with the Shipyard to transport hazardous waste to American Recovery in Baltimore, Maryland.

6.1.8.3 Mercury Wastes. The Shipyard is the central collection point for mercury waste disposal for several military installations in the area, including Brunswick Naval Air Station and the submarine base in New London, Connecticut. The wastes are temporarily stored in Building 98 at the Shipyard until they are transported offsite for disposal.

6.1.8.4 Asbestos Wastes. The Transportation Shop picks up the asbestos (from pipe insulation and floor and ceiling tiles) from repair and renovation operations on boats and in buildings. The asbestos is temporarily stored adjacent to Building 93 until it is transported offsite by a commercial hauler.

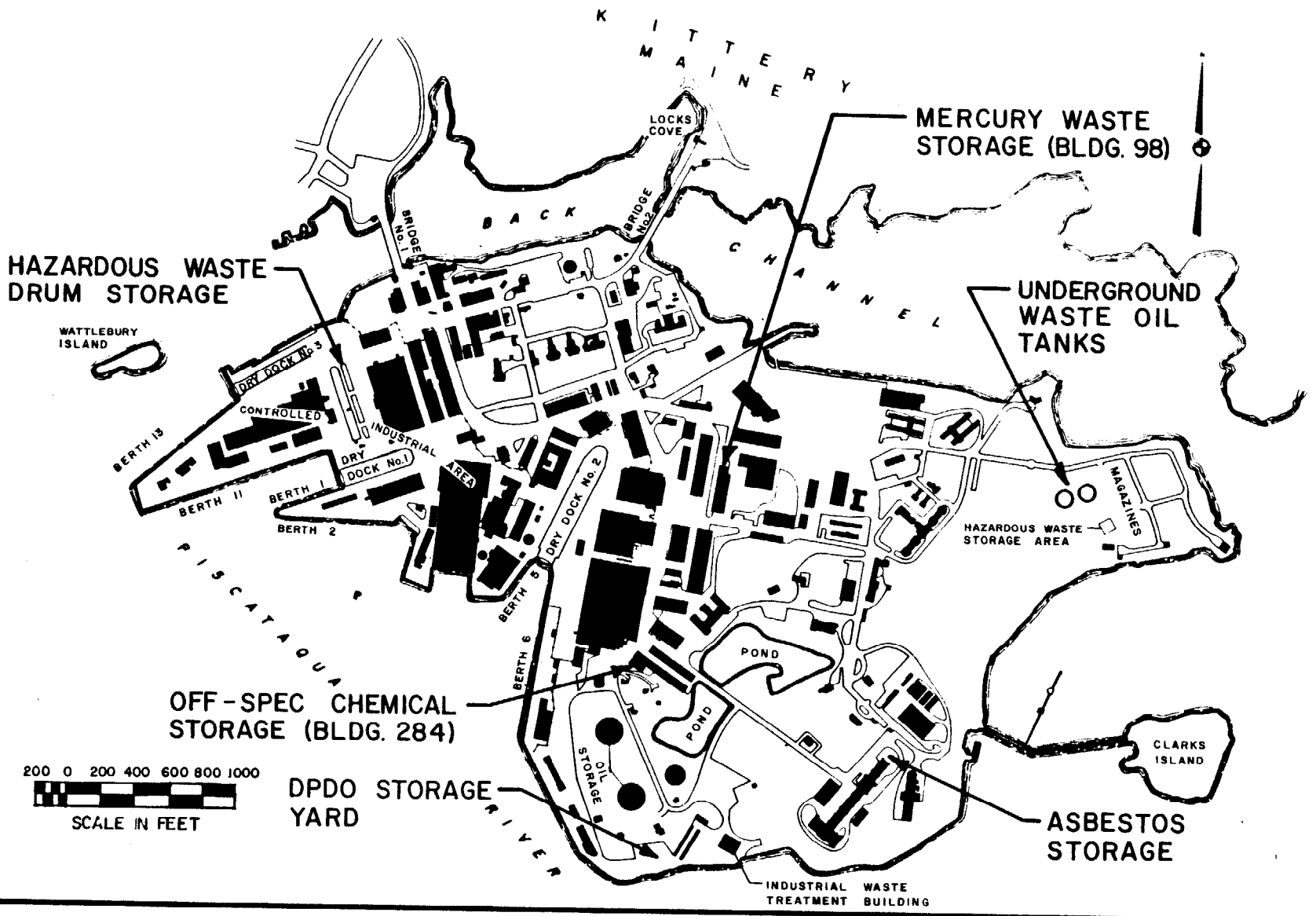


FIGURE 6-1

CHEMICAL AND HAZARDOUS WASTE STORAGE FACILITIES

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL SHIPYARD

6.1.8.5 Aqueous Metals, Acids, and Alkali Solutions. These wastes are generated mainly from metal-finishing operations and are stored temporarily in tanks adjacent to the various work areas. The Transportation Department delivers these industrial wastes by tank truck to the industrial waste treatment plant.

After treatment, the residual heavy metal sludge is transported offsite for ultimate disposal.

6.1.9 Pesticides and Herbicides. The pesticides and herbicides used for the control of insect pests and weeds at the Shipyard cover a variety of materials and formulations, depending on the need. A list of representative compounds and their formulations commonly used at the Shipyard is presented in Table 6-5. Pesticides presently in use are similar to those used in the late 1960's. As such, past practices of pesticide and herbicide use and disposal have been carefully managed. Very little pesticide waste is generated at the Shipyard, and the quantity that is produced is manifested and disposed of at an offsite location.

Before the potential for some pesticides to cause environmental damage was recognized (early 1960's), cleanup and disposal of pesticide and herbicide containers may have been less strictly regulated. It is possible that containers with significant residues may have been deposited at the Jamaica Island landfill. The pesticide and herbicide program at the Shipyard is limited, however, and it is doubtful that sufficient quantities were deposited in the landfill to warrant further investigation.

No firm evidence was discovered during the IAS that suggested that pesticide residues or waste containers were disposed of at any location at the Shipyard.

6.2 ORDNANCE STORAGE. Ordnance is stored in the magazines at Jamaica Island. Munitions include small arms ammunition, pyrotechnics, and Poseidon gas generators. The gas generators are used to test SSBN missile tubes during post-repair sea trials. Vehicles transporting the gas generators on the base are escorted by security and fire department personnel at all times until on-loading is completed. Ordnance is transported from the magazines to the berths where the submarines are moored during overhaul. There are no other ordnance storage or handling areas at the Shipyard.

Table 6-5

Pesticides, Herbicides, and Formulations Commonly Used at the Portsmouth Naval Shipyard

Pesticide	Formulation
Baygon	Aerosol -- emulsifiable concentrate
Pyrethrum	Aerosol -- capsule
Dursban	Bait -- emulsifiable concentrate, aerosol
Malathion	Emulsifiable concentrate, wettable powder
Chlordane	Dust
Weedar	Emulsion
2-4-D	Emulsion
Diazinon	Aerosol, emulsifiable concentrate
Ficam	Wettable powder
DEET	Lotion aerosol

CHAPTER 7. WASTE PROCESSING

7.1 LIQUID WASTE.

7.1.1 Sanitary Sewerage. The Shipyard is served by a sanitary sewerage system that pumps raw wastewater into the municipal sewerage system operated by the Town of Kittery. Wastewater flows average approximately 150,000 gallons per day. The Shipyard's sewer system is relatively new, having been installed during the period of 1968 to 1970. Prior to that time, a combined sewer system served the facility. Storm water and all sanitary and industrial sewage were discharged through a series of outfalls directly to the harbor. This condition persisted from the inception of the facility in 1800 until the completion of the new sewerage system in 1970. With the installation of the new system, the old combined system is now used only for the conveyance of stormwater to the harbor.

A family housing facility consisting of 187 units is located off-base in the Town of Kittery in the Admiralty Village development. The sewage from this 600-unit development is treated separately by a primary treatment facility operated by the town and consisting of an imhoff tank and chlorination. An average of 150,000 gallons per day of treated sewage is then discharged to a tidal inlet which is approximately 2 miles from the main harbor.

The town has applied for an EPA construction grant to connect all 600 units, both Navy and civilian, to the town's sewerage system. It appears that the existing treatment operations will remain until a grant is obtained from EPA.

7.1.2 Industrial Waste Processing. Figure 7-1 shows the manner in which all categories of hazardous wastes generated at the Shipyard are processed. Industrial wastes generated at the Shipyard consist primarily of acidic, alkaline, and metal-plating rinse baths. Prior to the construction of an industrial wastewater treatment facility in 1975, all such wastes were discharged directly to the Piscataqua River. In addition, lead sediment from decommissioned batteries was dumped directly to the river. Studies of the river bottom sediments adjacent to the Shipyard showed elevated heavy metals levels, notably in the vicinity of Berth 6, which are considered to be at least in part attributable to these disposal practices. This is discussed further in Chapter 8.

7.1.2.1 Industrial Waste Treatment Plant. The industrial wastewater treatment facility is designed to process up to 20,000 gallons per day of wastes on a continuous flow basis. All industrial wastes produced at the various yard locations are stored and then transported by tank truck to the treatment facility. The wastes are unloaded to the various unit operations.

The plant can treat acidic and alkaline wastes by neutralization, aqueous heavy metal wastes by precipitation followed by filtration, and chromium wastes by reduction followed by precipitation. The effluent from the settling tank is passed through sand filters to remove solids, followed by activated carbon adsorption to remove nickel complexes and EDTA (ethylenediamine tetraacetic acid) and other metal-chelate complexes. Following the filtration and adsorption systems the effluent enters the sanitary sewer and is discharged along with the

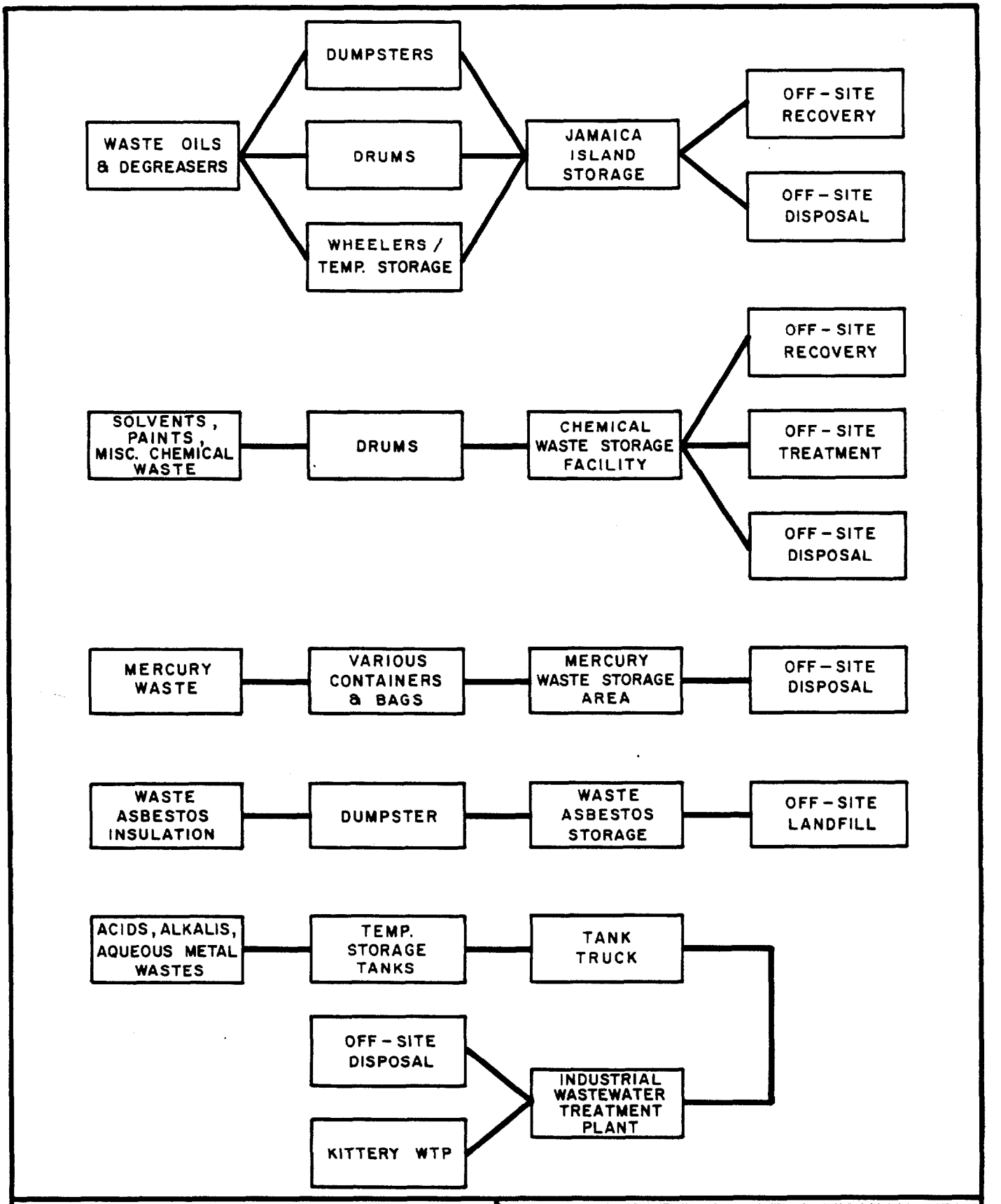


FIGURE 7-1

HAZARDOUS WASTE PROCESSING

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL SHIPYARD

yard's sanitary wastes to the Kittery Municipal Treatment Plant. The sludge from the Shipyard plant is concentrated on a diatomaceous earth precoat vacuum filter and disposed of by a private contractor. The treatment facility, as mentioned, was designed for continuous flow operation. However, the large plating shop operated by Shop 31, which was to provide the bulk of the influent flow, was terminated shortly after the plant was completed and the plant is now operated on a batch basis.

7.1.3 Freon Processing. Some of the Freon used at the Shipyard in cleaning and degreasing operations is recycled onsite. The Service Shop (X-99) operates a Freon still in Building 174. Only lightly contaminated Freon is currently processed in this still. The redistilled Freon is pumped into a tank truck and made available to the shops using it in production. The still bottom residues are disposed of by contract to offsite disposal.

7.1.4 Silver Processing. A silver reclamation process is run in support of the DLA Precious Metals Recovery Program. The Shipyard Photography Laboratory saves spent fixer solution and takes it to the Film Control Section (Code 133.12) of the Quality Assurance Office. The Film Control Section processes all weld x-rays and generates large quantities of silver-contaminated fixer. The two fixer wastes are combined and an electrolytic recovery system is used to remove the silver before the waste fixer is sent to the sanitary sewer. Other small reclamation operations include ion-exchange columns operated by the Reproductions Section (Code 202.13) and the x-ray laboratory of the Northeast Regional Medical Clinic. The Reproductions Section column recovers silver from the waste stream of a Chronaflex machine, and the clinic recovers silver from waste x-ray fixer.

7.1.5 Offsite Disposal Contracts. The Public Works Department currently disposes of Shipyard environmentally-sensitive wastes through two annual disposal contracts. Shipyard hazardous wastes are shipped offsite for treatment and/or disposal by contract. Each shipment is accompanied by a State of Maine manifest which is completed by the permitted treatment/disposal facility and returned to the Shipyard.

The Public Works Department writes contracts for mercury disposal and wastewater treatment plant sludge disposal. Certificates are required from the final mercury disposal site that the waste will be accepted before it is released to the contractor. The appropriate local, state, and Federal permits for the transporter are also required for mercury waste disposal. Copies of local, state, and Federal permits and licenses must be submitted by the sludge disposal contractor prior to sludge removal. Certificates of disposal signed by an official at the disposal facility must be returned to the Officer in Charge of Construction at the Public Works Department.

The DLA is the route for offsite disposal of scrap metals and off-specification or expired chemicals. An advertisement that a lot of scrap metal or chemicals is available is made nationwide. Bids are received by DLA, and the high bidder receives and must remove the scrap metal or chemicals.

The Shipyard-generated industrial wastes, such as boiler soot, sandblast grit, and oily wastes, which are not hazardous under RCRA, but regulated by the State, are shipped offsite for disposal with a special industrial waste disposal contract.

7.1.6 Waste Oils. Waste oils consist of cooling and cutting oils, motor oils, transmission oils, and hydraulic oils that are collected in drums or dumpster containers and transferred to underground storage tanks at Jamaica Island. The oil is then removed by private contractors for offsite recovery or disposal. An estimated 103,000 gallons of these oils is disposed of annually.

7.2 SOLID WASTE.

7.2.1 Collection, Transportation, and Disposal of Solid Waste. Trash, refuse, and garbage are collected at over 200 locations at the Shipyard by the Public Works Department. The solid waste is temporarily stored in 4- to 6-cubic yard containers, and once picked up is transported to a transfer station on the facility where it is compacted and then hauled off-base for disposal. Currently, the Shipyard disposes of all of its refuse at an incinerator-resource recovery facility located at Pease Air Force Base in Newington, New Hampshire. This operation is approved by both state and Federal regulatory agencies, and should serve the Shipyard's needs for the foreseeable future.

In the past, refuse was disposed of at the Town of Kittery's landfill, and prior to that most of the solid waste was disposed of on the Shipyard premises. Trash was either buried directly in one or more tidal flats, or incinerated first with the ashes then being buried in the tidal flats.

Solid waste from the Admiralty Village housing area is collected and disposed of by the Town of Kittery.

7.2.2 Sandblast Grit. Spent sandblast grit is generated primarily from paint removal operations in the three dry docks at the Shipyard. A 1980 report estimated that as much as 5,900 tons of this waste is generated annually. The grit is not a hazardous waste under RCRA; however, disposal is regulated by the State. Presently, spent sandblast grit is landfilled at a State-approved site in Hamden, Maine. In the past, the grit was deposited in the Jamaica Island landfill, a tidal flat that was considered to be a secure landfill operation by the Shipyard.

However, in June 1982 the Maine DEP stipulated that sandblast grit could not be deposited at this location because the site was not secure.

7.2.3 Mercury-Contaminated Waste. Mercury waste consists mainly of dilute mercuric nitrate solution from laboratory work and broken thermometers. This waste was at one time disposed of at the Shipyard by burial in concrete encasements. Now the waste is drummed, stored, and disposed of offsite by a private contractor.

7.2.4 Asbestos Wastes. Asbestos wastes consist primarily of pipe insulation and floor and ceiling tiles removed from rehabilitation projects on the submarines and within buildings at the Shipyard. The material is placed in plastic bags and removed from the Shipyard and disposed of by a private contractor.

7.3 INCINERATORS. There are no incinerators in use at the Shipyard. As noted in subsection 7.2.1, the Shipyard disposes of its refuse at an incinerator at Pease Air Force Base.

7.4 ORDNANCE. There is no processing of ordnance or munitions at the Shipyard.

CHAPTER 8. DISPOSAL SITES AND POTENTIALLY CONTAMINATED AREAS

8.1 INTRODUCTION. In this chapter each of the sites identified in the IAS as a disposal site or a potentially-contaminated area is discussed in more detail. Figure 8-1 shows the locations of these sites. Photographs of the disposal areas are also presented in this chapter.

8.2 SITE 1, JAMAICA ISLAND LANDFILL.

8.2.1 History. This site is located in an area that was originally open tidal flats (see Figure 8-2). Over a 20-year period the tidal flats were filled in with many kinds of materials. Construction/demolition debris, excavated materials, and general rubble and trash were deposited in the area to the point that it became known as the Jamaica Island "landfill."

8.2.2 Hazardous Materials Present. The area is approximately 25 acres in size, and contains a substantial amount of materials now considered hazardous. Table 8-1 shows some of the materials that were buried at the site over the years.

While not specifically documented, it was reported by personnel at the Shipyard that waste oils containing PCB were probably deposited at this site also. This practice was limited to those years before 1972 when a 7,000-gallon holding tank was constructed near the magazine area on Jamaica Island. This tank is now used to store waste oils. Contract services are provided for periodic collection and disposal offsite.

8.2.3 Other Documentation of Wastes. A study of solid waste disposal methods at the Shipyard conducted in 1971 reported that, "We understand that the landfill contains 500 five gallon containers of fire fighting chemicals, numerous 55-gallon drums of cosmoline, 30 drums of unknown materials and powdered chlorine" (Jackson & Moreland, 1971).

Another study prepared by the Northern Division, NAVFAC in 1977, evaluated the feasibility of constructing a 200-family housing unit on the landfill. Several test pits and soil borings were made, and it was reported that 55-gallon drums were uncovered in addition to other rubble and debris (Geotechnical Engineers, 1977).

8.2.4 Dredge Spoils Disposal. In 1978 the Shipyard received approval to dredge over 100,000 cubic yards of material from Berths 6, 11, and 13, and to dispose of this material in the location shown on Figure 8-3. The material was placed on top of the landfill and was encapsulated by a clay barrier wall along the Piscataqua River and a clay cap to prevent infiltration. It appears from a review of available boring logs, however, that the bottom of the site contains only sporadic clay deposits and is essentially unlined.

Sediment analyses conducted in 1976 at Berths 6, 11, and 13 indicated that the dredge spoils contained heavy metals, particularly lead and cadmium. Cyanide, mercury, and PCBs were also found in the dredge spoils in several samples, but the total quantity of these contaminants is estimated to be significantly less than the heavy metals contamination.

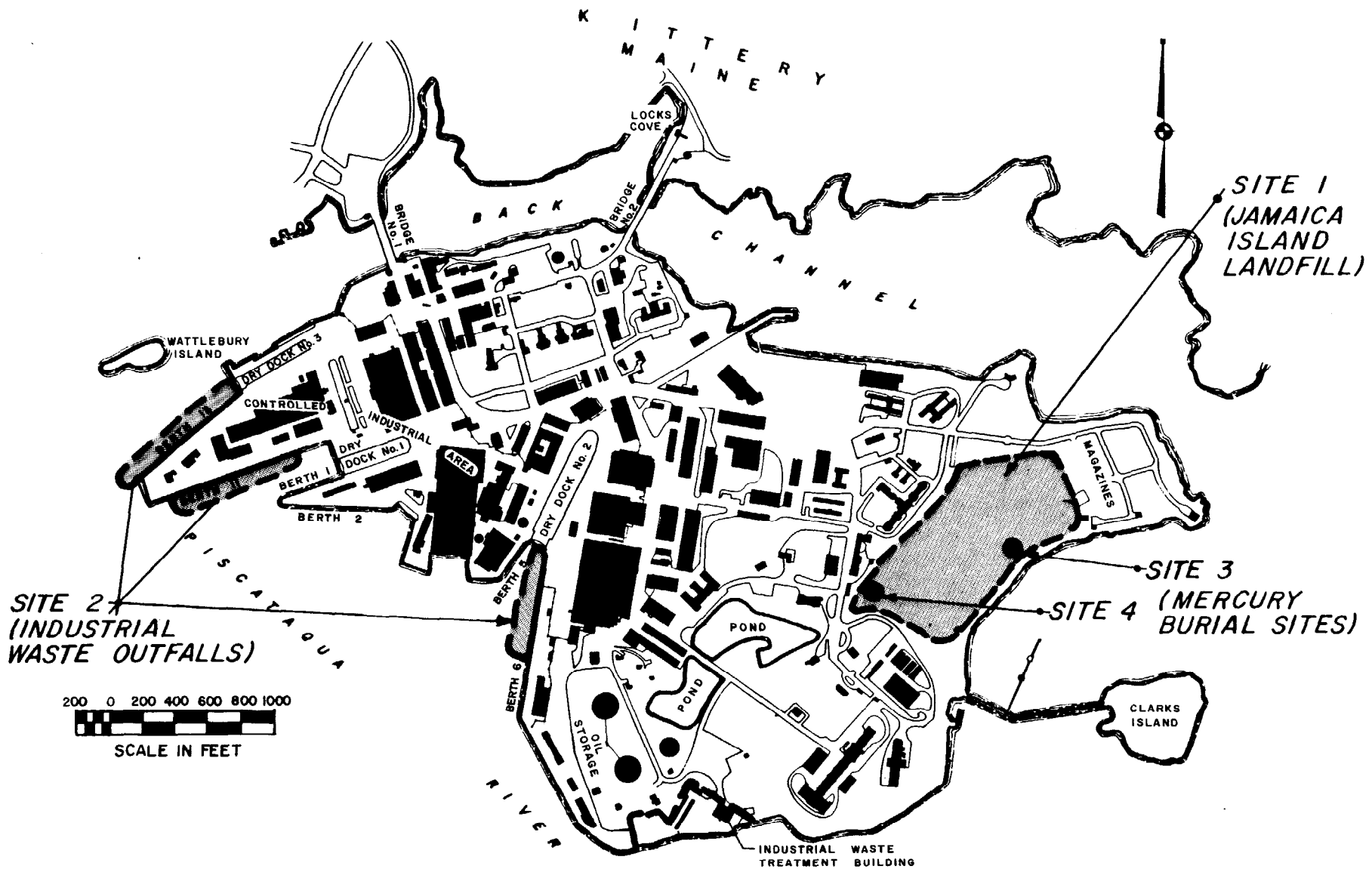


FIGURE 8-1
PORTSMOUTH NSY DISPOSAL SITES

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

FIGURE 8-2

SITE 1 – JAMAICA ISLAND LANDFILL

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

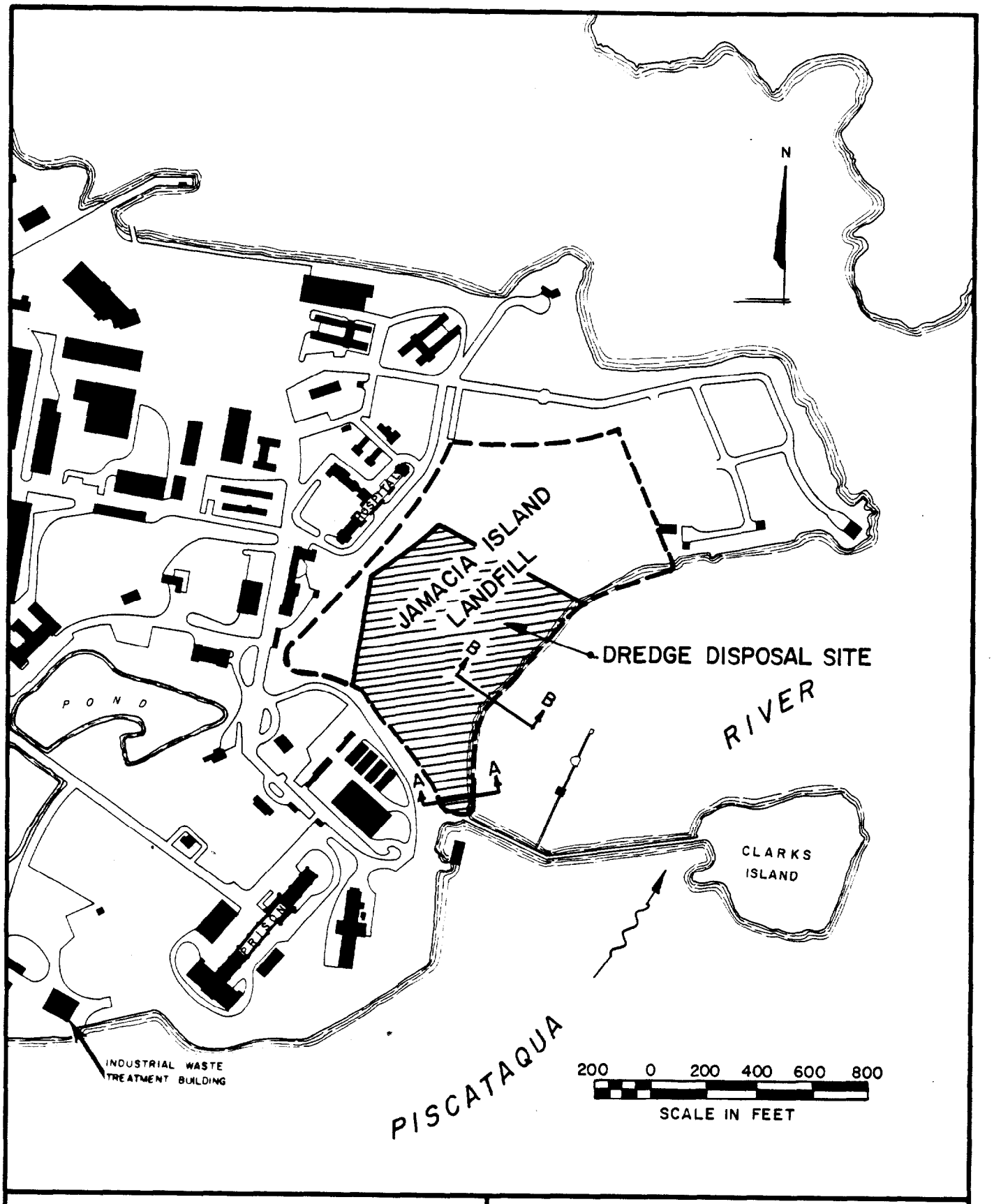


FIGURE 8-3

JAMAICA ISLAND LANDFILL

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

Table 8-1

Hazardous Materials Disposed of at Site 1, Jamaica Island Landfill

Substance	Estimated Quantity	Time Period	Comments
Plating sludges			
Chrome	5,000 - 10,000 pounds	1945-1972	Sludges were mixed in with normal refuse and were disposed of directly into the landfill. Exact location unknown.
Lead	5,000 - 10,000 pounds	1945-1972	
Cadmium	5,000 - 10,000 pounds	1945-1972	
Asbestos insulation	Several thousand pounds	1945-1960	Exact location unknown.
Volatile organics			
TCE, methylene chloride, toluene, MEK	20,000 gallons	1955-1975	Drums were taken to the landfill where wastes were drained out directly onto the ground.
Acetylene and chlorine gas cylinders	100-200 cylinders	1955	Cylinders were buried full.
Contaminated dredge spoils containing:		1978	Total spoils deposited was 108,000 cubic yards. Small amounts of PCBs and mercury were also found in dredge spoils. Dredge material came from sediments at Berths 6, 11, and 13.
Chromium	5,000 pounds		
Lead	20,000 pounds		
Waste paints and solvents	500,000 gallons	1945-1965	Probably disposed of in whole drums.
Spent sandblast grit	50,000 tons/year	1945-1975	Scattered throughout the site.

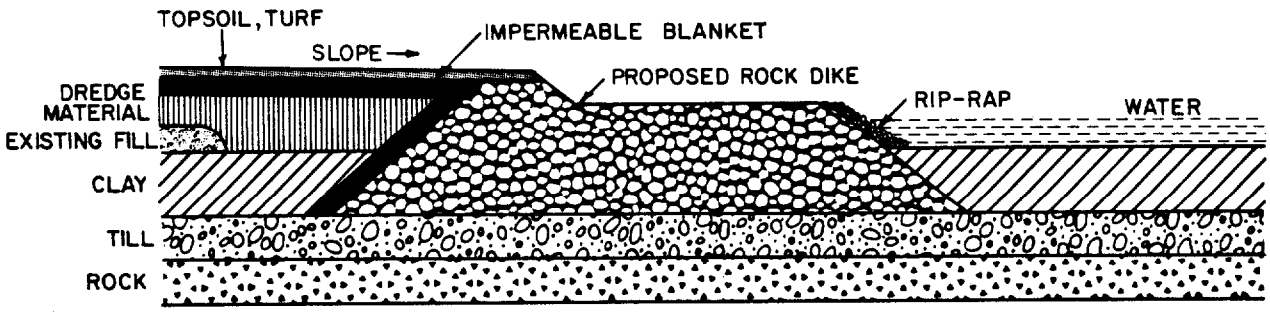
8.2.5 Migration Pathway. From inspections of boring logs and other documents, the site appears to be underlain by sporadic clay deposits, but is mostly sand and gravel, cobbles, and boulders. After the dredge spoils were laid down in 1978 a 2-foot clay cap was constructed over that portion of the landfill to prevent infiltration. A clay barrier on the inside of the rock dike was also constructed as shown on Figure 8-4. However, the bottom clay liner shown on the figure only extends about 5 feet horizontally into the fill. Mean low water is about 92 feet MSL and it appears that tidal fluctuations (± 10 feet) are causing an inundation of the landfill and the dredge spoils layer on top of the landfill. This is probably causing a flushing action whereby contaminants from the landfill can migrate out from underneath the site and into the Piscataqua River. The conclusion that the site cannot be considered "secure" is further underscored by the fact that the Maine State Department of Environmental Protection reached the same conclusion in June 1982 when it was evaluating a request from the Shipyard to dispose of spent sandblasting grit and boiler plant soot at the landfill. This request from the Shipyard was subsequently denied by the Maine Department of Environmental Protection.

8.3 SITE 2, INDUSTRIAL WASTE OUTFALLS.

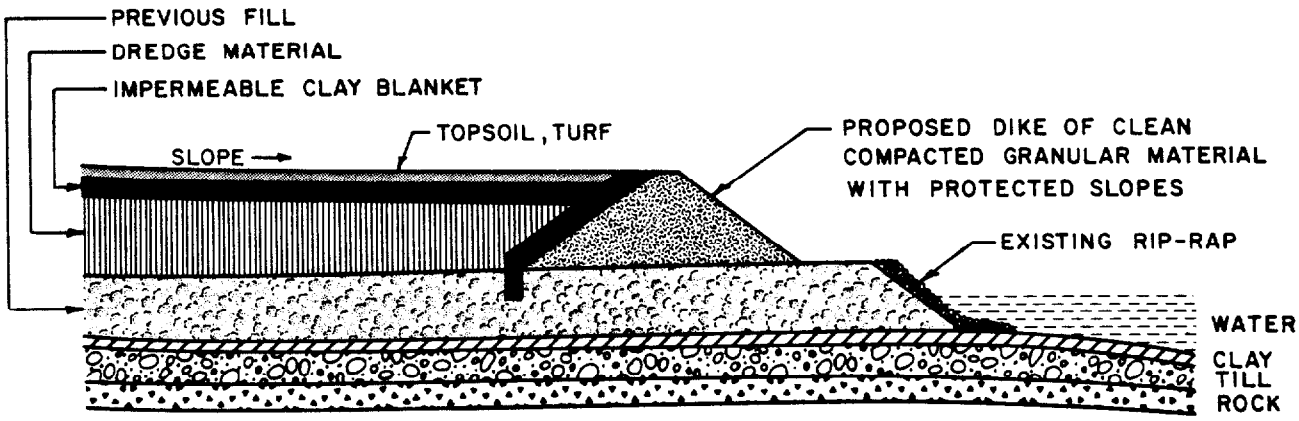
8.3.1 Previous Discharge Practices. From a review of a dredging study conducted in 1977 at the Portsmouth Naval Shipyard there is documented evidence that the berth areas, specifically, Berths 6, 11, and 13, contain contaminated sediments. From a review of the sewerage plans it was discovered that industrial wastewaters from the plating shop, battery shop, and other similar activities were discharged directly into these areas and are the probable cause of the contamination found in the sediments. Figure 8-5 shows the berth areas that were found to be contaminated and the locations of the major outfalls. Interviews with shop personnel indicated that prior to operation of the industrial waste treatment plant in 1975, all wastewaters were discharged directly into the Piscataqua River through outfalls located at these berths.

8.3.2 Sediment Chemistry. In 1978 22 sediment samples were analyzed; 13 of these samples were surface samples and the remaining nine were taken at the proposed dredge depth. Figure 8-6 shows the locations of the samples. A review of the data in the dredging report shows that some potentially toxic pollutants are present in quantities greater than that normally found in nearshore sediments. Table 8-2 is a summary of the results of the sediment analysis conducted prior to the dredging in 1979.

> "Levels of PCBs at most of the twenty-two stations were comparable with concentrations reported for polluted areas (disposal sites and industrial areas). The concentrations of PCBs at Station 17 at both surface and depth were significantly higher than reported for coastal waters of Maine, England, and the Mediterranean Sea.
>
> "Total cyanide concentrations were substantial only at Stations E1, E3, and E5. Phenol concentrations were low and ranged from less than 0.05 ppm (limit of detection) to 1.02 ppm with most having concentrations less than 0.05 ppm.



SECTION A-A AFTER CONSTRUCTION



SECTION B-B

SOURCE:

Candidate EIS for Dredging, Portsmouth Naval Shipyard, Portsmouth, New Hampshire, March 1978.

FIGURE 8-4
TYPICAL PROFILE SECTIONS
AT SITE I
JAMAICA ISLAND LANDFILL

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

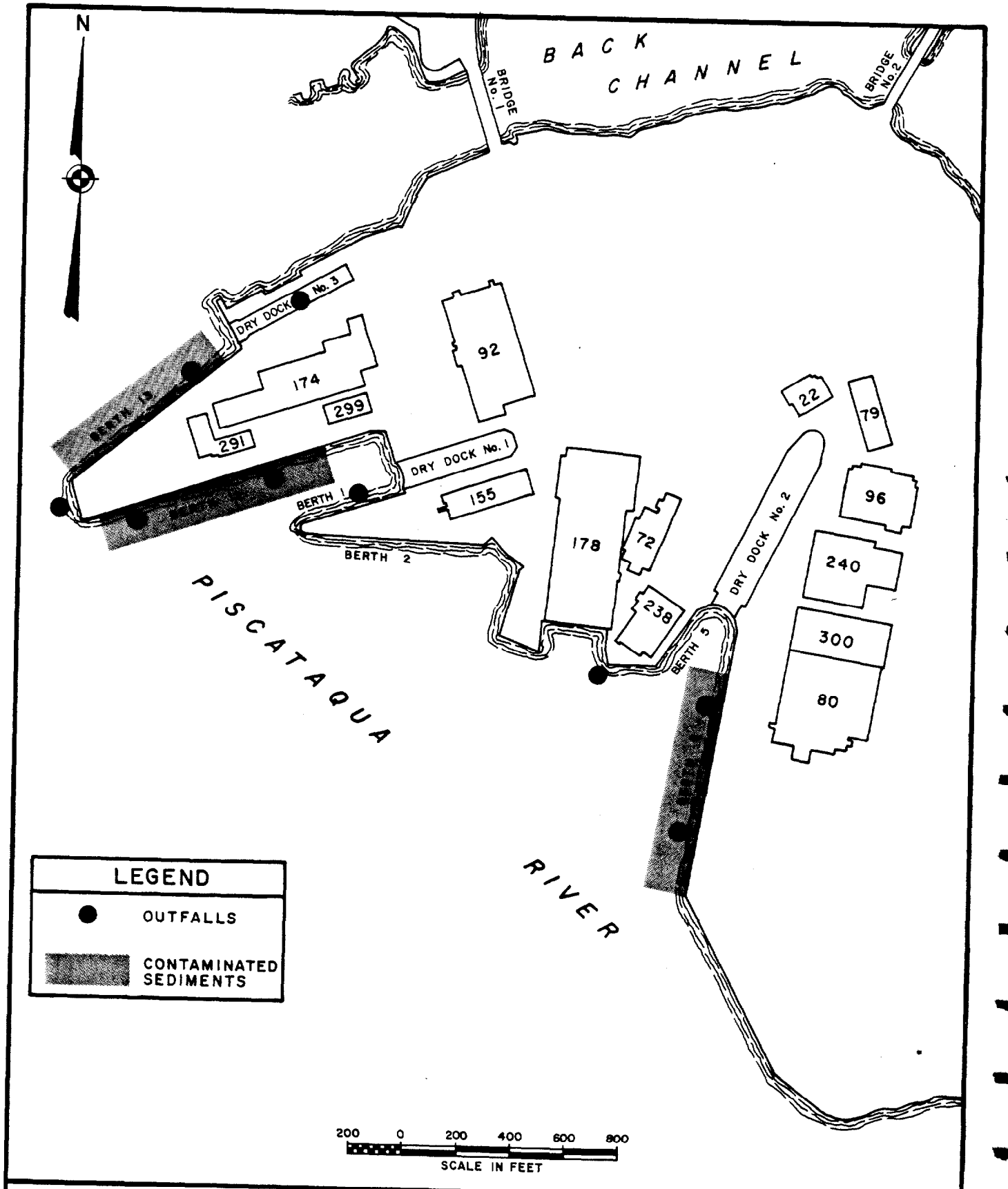


FIGURE 8-5

SITE 2

INDUSTRIAL WASTEWATER OUTFALLS

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL
SHIPYARD

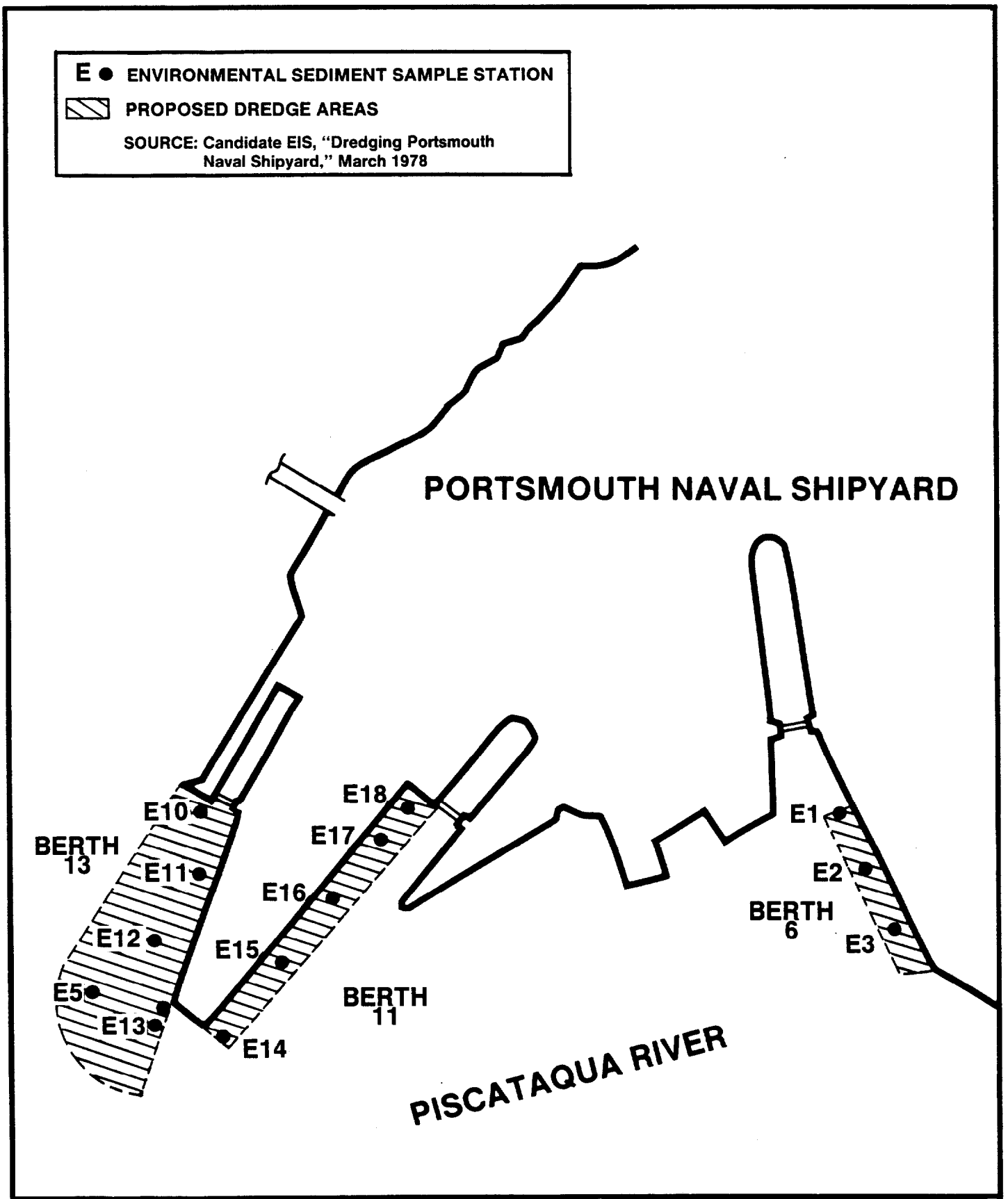


FIGURE 8-6
LOCATIONS OF TEST BORINGS AT SITE 2, INDUSTRIAL WASTE OUTFALLS

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL SHIPYARD

Table 8-2

Sediment Chemistry in Vicinity of Berths 6, 11, and 13, Portsmouth Naval Shipyard

Sample	Moisture Percent	Organic Carbon (% Dry Wgt.)	Volatile Solids (% LOI)	Total Phosphate (PO_4) (% Dry Wgt.)	Nitrate (NO_3) (% Dry Wgt.)	COD (% Dry Wgt.)	TKN (% Dry Wgt.)
E-1 S	30.0	1.97	5.79	440×10^{-4}	28.3×10^{-4}	11.3	0.1107
E-2 S	19.0	0.33	2.78	477×10^{-4}	17.6×10^{-4}	1.17	0.0149
E-3 S	22.7	0.78	6.84	254×10^{-4}	32.7×10^{-4}	2.14	0.0665
E-5 S	37.3	0.82	7.29	364×10^{-4}	19.8×10^{-4}	5.08	0.0905
E-5 D	21.7	0.48	1.58	566×10^{-4}	33.8×10^{-4}	0.75	0.0172
E-10 S	43.3	0.93	3.21	509×10^{-4}	18.6×10^{-4}	7.01	0.1679
E-11 S	32.1	1.49	3.55	663×10^{-4}	24.4×10^{-4}	5.88	0.0658
E-11 D	13.0	0.15	1.21	$1,740 \times 10^{-4}$	24.7×10^{-4}	0.90	0.0162
E-12 S	22.4	0.40	1.74	270×10^{-4}	14.0×10^{-4}	1.00	0.0289
E-12 D	22.3	0.30	1.29	659×10^{-4}	66.3×10^{-4}	1.01	0.0228
E-13 S	17.4	0.33	2.82	275×10^{-4}	4.3×10^{-4}	2.42	0.0071
E-13 D	14.5	0.20	0.57	180×10^{-4}	45.4×10^{-4}	1.08	0.0007
E-14 S	14.7	0.20	1.40	753×10^{-4}	10.6×10^{-4}	2.50	<0.0001
E-14 D	15.7	0.15	6.55	273×10^{-4}	43.7×10^{-4}	1.61	<0.0001
E-15 S	18.6	0.54	2.28	398×10^{-4}	17.0×10^{-4}	1.41	0.0324
E-15 D	11.8	0.26	0.71	475×10^{-4}	14.5×10^{-4}	0.78	0.0041
E-16 D	22.9	3.49	3.0	586×10^{-4}	13.6×10^{-4}	3.60	0.0423
E-16 D	6.5	0.21	1.12	399×10^{-4}	50.6×10^{-4}	0.37	---
E-17 S	21.2	0.19	1.40	311×10^{-4}	21.0×10^{-4}	3.71	0.0284
E-17 D	15.2	0.43	2.38	546×10^{-4}	27.7×10^{-4}	5.08	0.0387
E-18 S	21.1	1.27	1.79	430×10^{-4}	78.0×10^{-4}	3.42	0.0671
E-18 D	18.2	0.70	3.62	560×10^{-4}	10.3×10^{-4}	1.98	0.0280

Source: Candidate EIS, Dredging Portsmouth Naval Shipyard, March 1978.

Note:

1. To convert to parts per million (mg/kg) multiply by 1×10^4.
2. Suffix S = Surface sediment.
   Suffix D = Dredge depth sediment.

Table 8-2
(Continued)

Sample	DDT (% Dry Wgt.)	PCB Arachlor 1254 (% Dry Wgt.)	Cyanide (% Dry Wgt.)	Phenol (% Dry Wgt.)	Oil & Grease (% Dry Wgt.)	Sulfide (% Dry Wgt.)
E-1 S	0.023×10^{-4}	0.221×10^{4}	3.5×10^{-4}	1.02×10^{-4}	0.331	106×10^{-4}
E-2 S(2.5)	$<0.005 \times 10^{-4}$	0.020×10^{-4}	$<0.1 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.563	142×10^{-4}
E-3 S	$<0.005 \times 10^{-4}$	0.023×10^{-4}	1.2×10^{-4}	0.74×10^{-4}	0.814	149×10^{-4}
E-5 S	$<0.005 \times 10^{-4}$	$<0.010 \times 10^{-4}$	$<0.1 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.283	502×10^{-4}
E-5 D	$<0.005 \times 10^{-4}$	0.022×10^{-4}	2.8×10^{-4}	$<0.05 \times 10^{-4}$	0.794	$1,543 \times 10^{-4}$
E-10 S	$<0.005 \times 10^{-4}$	0.050×10^{-4}	$<0.2 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.202	$4,797 \times 10^{-4}$
E-11 S	0.053×10^{-4}	0.317×10^{-4}	$<0.2 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.516	573×10^{-4}
E-11 D	$<0.005 \times 10^{-4}$	$<0.010 \times 10^{-4}$	0.2×10^{-4}	$<0.05 \times 10^{-4}$	0.041	85×10^{-4}
E-12 S	$<0.005 \times 10^{-4}$	0.159×10^{-4}	$<0.2 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.063	501×10^{-4}
E-12 D	$<0.005 \times 10^{-4}$	0.136×10^{-4}	$<0.2 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.056	611×10^{-4}
E-13 S	$<0.005 \times 10^{-4}$	0.141×10^{-4}	$<0.2 \times 10^{-4}$	0.29×10^{-4}	0.794	168×10^{-4}
E-13 D	$<0.005 \times 10^{-4}$	0.412×10^{-4}	0.9×10^{-4}	$<0.05 \times 10^{-4}$	0.493	62×10^{-4}
E-14 S	$<0.005 \times 10^{-4}$	$<0.010 \times 10^{-4}$	$<0.5 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.084	87×10^{-4}
E-14 D	$<0.005 \times 10^{-4}$	$<0.010 \times 10^{-4}$	$<0.2 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.875	63×10^{-4}
E-15 S	$<0.005 \times 10^{-4}$	0.026×10^{-4}	$<0.2 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.087	271×10^{-4}
E-15 D	$<0.005 \times 10^{-4}$	$<0.010 \times 10^{-4}$	0.6×10^{-4}	$<0.05 \times 10^{-4}$	0.034	$1,973 \times 10^{-4}$
E-16 S	0.022×10^{-4}	0.020×10^{-4}	0.1×10^{-4}	0.10×10^{-4}	0.242	547×10^{-4}
E-16 D	$<0.005 \times 10^{-4}$	0.042×10^{-4}	$<0.1 \times 10^{-4}$	0.15×10^{-4}	0.032	$1,292 \times 10^{-4}$
E-17 S	$<0.005 \times 10^{-4}$	4.036×10^{-4}	$<0.1 \times 10^{-4}$	0.49×10^{-4}	0.202	$1,721 \times 10^{-4}$
E-17 D	$<0.005 \times 10^{-4}$	3.420×10^{-4}	0.6×10^{-4}	0.81×10^{-4}	0.445	$4,086 \times 10^{-4}$
E-18 S	$<0.005 \times 10^{-4}$	0.157×10^{-4}	$<0.1 \times 10^{-4}$	0.09×10^{-4}	0.726	1.849×10^{-4}
E-18 D	$<0.005 \times 10^{-4}$	0.010×10^{-4}	$<0.2 \times 10^{-4}$	$<0.05 \times 10^{-4}$	0.125	891×10^{-4}

Note: To convert to parts per million (mg/kg) multiply by 1×10^{4}.

Table 8-2
(Continued)

Sample	COPPER Cu (% Dry Wgt.)	Chromium Cr (% Dry Wgt.)	Cadmium Cd (% Dry Wgt.)	Lead Pb (% Dry Wgt.)	Zinc Zn (% Dry Wgt.)	Mercury Hg (% Dry Wgt.)
E-1 S	480×10^{-4}	126×10^{-4}	10×10^{-4}	$7,000 \times 10^{-4}$	$4,260 \times 10^{-4}$	2.40×10^{-4}
E-2 S	40×10^{-4}	190×10^{-4}	8×10^{-4}	240×10^{-4}	150×10^{-4}	0.40×10^{-4}
E-3 S	104×10^{-4}	72×10^{-4}	8×10^{-4}	210×10^{-4}	380×10^{-4}	0.04×10^{-4}
E-5 S	20×10^{-4}	82×10^{-4}	10×10^{-4}	80×10^{-4}	70×10^{-4}	1.04×10^{-4}
E-5 D	24×10^{-4}	104×10^{-4}	6×10^{-4}	70×10^{-4}	70×10^{-4}	0.08×10^{-4}
E-10 S	750×10^{-4}	438×10^{-4}	10×10^{-4}	640×10^{-4}	$4,860 \times 10^{-4}$	0.93×10^{-4}
E-11 S	550×10^{-4}	256×10^{-4}	8×10^{-4}	660×10^{-4}	$1,560 \times 10^{-4}$	0.03×10^{-4}
E-11 D	136×10^{-4}	82×10^{-4}	6×10^{-4}	100×10^{-4}	140×10^{-4}	0.53×10^{-4}
E-12 S	50×10^{-4}	158×10^{-4}	8×10^{-4}	120×10^{-4}	414×10^{-4}	0.03×10^{-4}
E-12 D	24×10^{-4}	82×10^{-4}	6×10^{-4}	80×10^{-4}	94×10^{-4}	0.01×10^{-4}
E-13 S	$1,000 \times 10^{-4}$	126×10^{-4}	6×10^{-4}	800×10^{-4}	$6,500 \times 10^{-4}$	2.39×10^{-4}
E-13 D	136×10^{-4}	18×10^{-4}	6×10^{-4}	100×10^{-4}	620×10^{-4}	0.03×10^{-4}
E-14 S	$3,850 \times 10^{-4}$	384×10^{-4}	6×10^{-4}	$3,300 \times 10^{-4}$	$17,200 \times 10^{-4}$	0.07×10^{-4}
E-14 D	$4,100 \times 10^{-4}$	126×10^{-4}	6×10^{-4}	720×10^{-4}	$3,660 \times 10^{-4}$	0.08×10^{-4}
E-15 S	270×10^{-4}	104×10^{-4}	6×10^{-4}	300×10^{-4}	$1,300 \times 10^{-4}$	0.07×10^{-4}
E-15 D	28×10^{-4}	66×10^{-4}	6×10^{-4}	50×10^{-4}	40×10^{-4}	0.01×10^{-4}
E-16 S	104×10^{-4}	256×10^{-4}	6×10^{-4}	150×10^{-4}	240×10^{-4}	0.01×10^{-4}
E-16 D	34×10^{-4}	82×10^{-4}	6×10^{-4}	70×10^{-4}	66×10^{-4}	3.38×10^{-4}
E-17 S	750×10^{-4}	320×10^{-4}	10×10^{-4}	$1,300 \times 10^{-4}$	$4,860 \times 10^{-4}$	5.50×10^{-4}
E-17 D	$1,100 \times 10^{-4}$	374×10^{-4}	10×10^{-4}	$1,600 \times 10^{-4}$	$5,500 \times 10^{-4}$	0.23×10^{-4}
E-18 S	210×10^{-4}	212×10^{-4}	8×10^{-4}	320×10^{-4}	600×10^{-4}	0.16×10^{-4}
E-18 D	78×10^{-4}	82×10^{-4}	8×10^{-4}	100×10^{-4}	260×10^{-4}	0.62×10^{-4}
Nearshore Sediments[1]	48	100		20		
Deep Sea Clay[2]	115	80		52	35	

[1]Wedepohl (1960).
[2]Turekian and Imbrie (1967); Turekian and Wedepohl (1961).

Note: To convert to parts per million (mg/kg) multiply by 1×10^4.

"The concentrations of oils and grease in the sediments were high, as were the concentrations of most heavy metals. Mercury values were higher at Stations E1, E13, and E17. As a comparison, contaminated sediments in Boston Harbor were found to contain up to 2.6 mg/kg of mercury and those of New Haven Harbor up to 2.55 mg/kg. Concentrations of copper, lead, and zinc were also especially high at several of the stations. These high levels of contaminants probably result from operations at the Naval base involving painting, fueling, soldering, etc. Alternatively, discharging of raw sewage or industrial effluents into the harbor may account for this contamination. Similar contaminant levels have been found in the industrialized New Bedford Harbor. Within the scope of this study, it was not possible to delineate either the exact source for the chemical contaminants or the reasons for some sites having significantly higher contaminants than others." (Parsons et al., 1978)

During the dredging activities much of this contaminated sediment was disposed of at Site 1 (Jamaica Island Landfill), which was discussed previously. It is difficult to determine how much of the sediment in the berth area or the entire waterfront area adjacent to the berths may still be contaminated.

It must also be noted that the sampling locations chosen for the dredging study were only in the immediate area of the berths to be dredged (Berths 6, 11, and 13). No firm data exist for other areas in the channel.

8.3.3 Potential Bioaccumulation. The migration pathway is clearly a direct discharge through outfalls into the Piscataqua River. These wastewaters contained pollutants and contaminants that precipitated and settled to the bottom of the river and contaminated the existing sediments.

From the information gathered during the onsite survey, there is insufficient evidence to suspect that the general area in the vicinity of the berths and dry docks is contaminated with potentially hazardous/toxic substances. The information indicates that some of these substances may be bioaccumulated in the marine biota in the area with the potential for affecting humans who eat the shellfish harvested in this area. A more comprehensive sediment sampling program is recommended at the time of the next dredging activity to better define the extent and nature of the potential contamination. Figure 8-7 is a photograph taken in 1982 showing the berth areas.

8.4 SITES 3 AND 4, MERCURY BURIAL SITES.

8.4.1 Previous Practices. In June 1981 the Shipyard notified EPA under CERCLA (Superfund) of the existence of a mercury waste burial site, as shown on Figure 8-8. Actually, two mercury burial sites were identified in the EPA notification.

Site 3 was used in 1973 for the disposal of mercury-contaminated wastes such as fluorescent bulbs, thermometers, mercury switches, and the like. Even items such as brooms, rags, and dustpans used to clean up broken items containing mercury were disposed of at this site. In excess of 1,000 pounds of this bulk waste was disposed of, but the actual amount of elemental mercury involved was probably only in the range of 1 to 2 pounds.

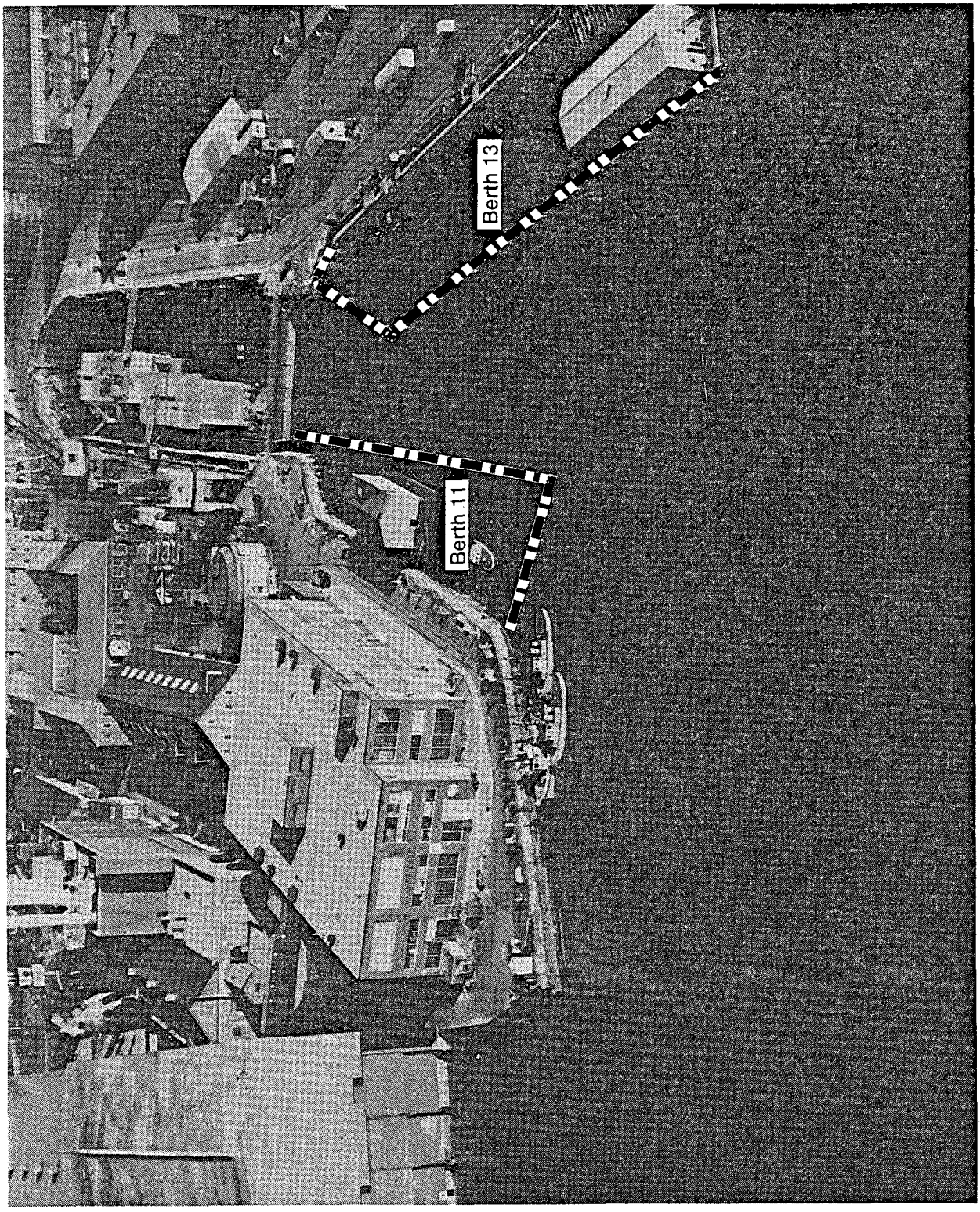


FIGURE 8-7

LOCATIONS OF CONTAMINATED BERTH AREAS

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL SHIPYARD

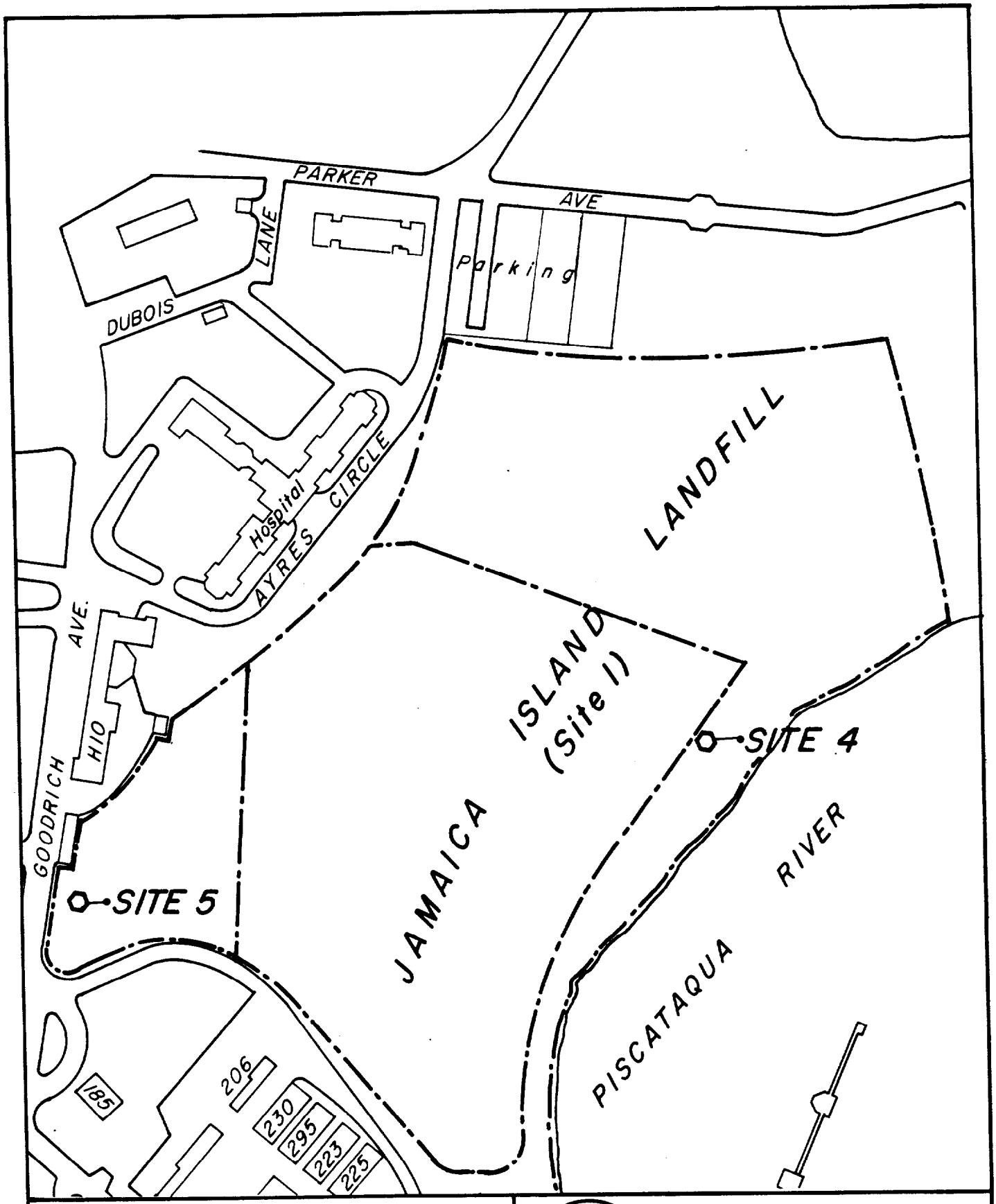


FIGURE 8-8
SITE 3 & 4 MERCURY BURIAL SITES

INITIAL ASSESSMENT STUDY
PORTSMOUTH NAVAL SHIPYARD

The waste was encapsulated in 4-foot diameter concrete pipe sections, which were capped with 1 foot of poured concrete on the top and bottom. There are about six of these vaults buried under approximately 8 to 10 feet of fill at Site 3. This site is not marked in the field, but the Shipyard Public Works Engineering Office has documented the location of the site on site drawings.

As noted, Site 4 was also the site for disposal of mercury-contaminated wastes. This site was used in 1974-1975, and is located as shown on Figure 8-7. This site also consists of six concrete vaults containing mercury-contaminated bulk waste, and is also covered with 8 to 10 feet of fill.

8.4.2 Secure Disposal. Since the vaults are totally enclosed with concrete it appears unlikely that any migration pathway is likely to exist that could cause an adverse impact on the environment or the public health.

8.4.3 Conclusions. Based on the information discovered about Sites 3 and 4 during the onsite survey, they are not recommended for confirmation studies. It is recommended, however, that the Shipyard mark the sites in the field to prevent any disturbance during possible future excavation or construction work in that vicinity.

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APPENDIX A

FLORA OF THE PORTSMOUTH HARBOR AREA

APPENDIX A

FLORA OF THE PORTSMOUTH HARBOR AREA

Common Name	Scientific Name
	Herbaceous Plants
Smooth cordgrass	*Spartina alterniflora*
Sale meadow grass	*Spartina patens*
Spike grass	*Distichlis spicata*
Black rush	*Juncus gerardi*
Reed grass	*Phragmites communis*
Milkweed	*Asclepias syriaca*
Skunk cabbage	*Symplocarpus foetidus*
Sphagnum moss	*Sphagnum* spp.
Water lily	*Nymphaea ordorata*
Cattail	*Typhalatifolia*
Purple loosestrife	*Lythrum salicaria*
Goldenrod	*Solidago* spp.
Broomsedge	*Andropogon virginicus*
Asters	*Aster* spp.
Lycopodium	*Lycopodium* spp.
Equisetum	*Equisetum* spp.
Sweet fern	*Comptonia peregina*
Jewelweed	*Impatiens biflora*
Rushes	*Juncus* spp.

Common Name	Scientific Name
	Shrubs
Junipers	Juniperus spp.
Inkberry	Ilex glabra
Sweet pepperbush	Clethra alnifolia
Swamp azalea	Rhododendron viscosum
Honeysuckles	Lonicera spp.
Grape	Vitis spp.
Bayberry	Myrica pennsylvanica
Blueberry	Vaccinium sp.
Sheep laurel	Kalmia angustifolia
Bittersweet	Celastrus scandens
Speckled alder	Alnus rugosa
Viburnums	Viburnum spp.
Wild rose	Rosa spp.
Sumac	Rhus spp.
Green brier	Smilax rotundifolia
Poison ivy	Rhus radicans
Blackberry	Rubus spp.
Witch hazel	Hamamelis virginiana
Raspberry	Rubus spp.
Black huckleberry	Gaylussacia baccata
Dogwoods	Cornus spp.
Spirea	Spirea spp.
Eastern red cedar	Juniperus virginiana

Common Name	Scientific Name
	Trees
Red maple	Acer rubram
Pin oak	Quercus palustris
Scarlet oak	Quercus coccinea
Silver maple	Acer saccharinum
Norway maple	Acer platanosides
Sycamore maple	Acer pseudoplatanus
Sugar maple	Acer saccharum
Shadbush	Amelanchier canadensis
Poplar	Populus spp.
Hemlock	Tsuga canadensis
Arborvitae	Thuja occidentalis
Thornless	Gleditsia triacanthos
Honey locust	Inermis
American beech	Fagus grandifolia
Japanese cherry	Prunus kwanzan
Northern red oak	Quercus borealis
Black oak	Quercus velutina
White oak	Quercus alba
Crabapple	Malus spp.
Plum	Prunus spp.
Sassafras	Sassafras albidum
Willow	Salix spp.
Yellow birch	Betula lutea

Common Name	Scientific Name
Trees (continued)	
American elm	*Ulmus americanas*
Tupelo	*Nyssa sylvatica*
Pignut hickory	*Carya glabra*
White ash	*Fraxinus americana*
White pine	*Pinus strobus*
Wild black cherry	*Prunus serotina*
Gray birch	*Betula populifolia*
White birch	*Betula papyrifera*
Black locust	*Robinia pseudoacacia*
Pitch pine	*Pinus rigida*
Norway spruce	*Picca abies*
White spruce	*Picca glauca*
Blue spruce	*Picca pungens*
Red pine	*Pinus resinosa*

APPENDIX B

FAUNA, INCLUDING AVIFAUNA, OF THE PORTSMOUTH HARBOR AREA

APPENDIX B

FAUNA, INCLUDING AVIFAUNA, OF THE PORTSMOUTH HARBOR AREA

Common Name	Scientific Name
	Mammals
White-footed mouse	*Peromyscus leucopus*
Woodland jumping mouse	*Napaeozapus insignis*
Meadow jumping mouse	*Zapus hudsonius*
House mouse	*Mus musculus*
Norway rat	*Rattus norvegicus*
Meadow vole	*Microtus pennsylvanicus*
Red-backed vole	*Clethrionomys gapperi*
Starnose mole	*Condylura cristata*
Masked shrew	*Sorex cinereus*
Smoky shrew	*Sorex fumeus*
Shorttail shrew	*Blarina brevicauda*
Shorttail weasel	*Mustela erminea*
Longtail weasel	*Mustela frenata*
Eastern grey squirrel	*Sciurus carolinensis*
Red squirrel	*Tamiasciurus hudsonicus*
Northern flying squirrel	*Glaucomys sabrinis*
Eastern chipmunk	*Tamias striatus*
Cottontail rabbit	*Sylvilagus* sp.
Raccoon	*Procyon lotor*
Opossum	*Didelphis marsupialis*

Common Name	Scientific Name
	Mammals (continued)
Wood chuck	Marmota monax
Skunk	Mephitis mephitis
Muskrat	Ondatra zibethica
Little brown bat	Myotis subulatus
Big brown bat	Eptesicus fucus
Red fox	Vulpes fulva
White-tailed deer	Odocoileus virgianus
	Other Species
Painted turtle	Chrysemys picta
Garter snake	Thamnophis sirtalis
Green frog	Rana clamitans
Leopard frog	Rana pipiens
	Birds
Blue winged teal	Anas discors
Green-winged teal	Anas carolinensis
Black duck	Anas rubripes
Mallard duck	Anas platyrhynchos
Common goldeneye	Bucephala clangula
Bufflehead duck	Bucephala albeola
Canada goose	Branta canadensis
Woodcock	Philohela minor
Pied-billed grebe	Podilymbus podiceps
Common loon	Gavia immer
Long-eared owl	Asio otus wilsonianus

Common Name	Scientific Name
Birds (continued)	
Marsh hawk	Circus cyaneus
Osprey (rare visitor)	Pandion haliaetus
Double-crested cormorant	Phalacrocorax auritus
Semi-palmated plover	Charadrius semipalmatus
Killdeer	Charadrius vociferus
Ring-billed gull	Larus delawarensis
Common tern	Sterna hirundo
Greater scaup	Aythya marila
Lesser scaup	Aythya affinis
Ruddy duck	Oxyura jamaicensis
Crows and ravens	Cornidae spp.
Common merganser	Mergus merganser
Turkey vulture	Cathartes aura
American coot	Fulica americana
Greater yellow legs	Totanus melanoleucus
Lesser yellow legs	Totanus flavipes
Spotted sandpiper	Actitus macularia
Barn owl	Tyto alba
Flicker	Colaptes auratus
Yellow bellied sapsucker	Sphyrapicus varius
Hairy woodpecker	Dendrocopos villosus
Downy woodpecker	Denrocopos pubescens
House wren	Troglodytes aedon

Common Name	Scientific Name
Birds (continued)	
Catbird	Dumetella carolinensis
Northern shrike	Lanius excubitor
Loggerhead shrike	Lanius ludovicianus
Warblers	Parulidae
Vireos	Vireonidae
Finches	Carpodacus spp.
Northern thrush	Serurus noveboracensis
Common red poll	Acanthis flammea
House sparrow	Passer domesticus
Redwing blackbird	Agelaius phoeniceus
Common grackle	Quiscalus quiscula
Rusty blackbird	Euphagus cyanocephalus
Brown-headed cowbird	Molothrus ater
Juncos	Junco spp.
Rufus-sided towhee	Pipilo erthrophthalmus
Nuthatches	Sittidae
Buntings	Calamospiza spp.
Evening grosbeak	Hesperiphona vespertina
Pine siskin	Spinus pinus
Belted kingfisher	Megaceryle alcyon
Great black-backed gull	Larus marinus
Herring gull	Larus argentatus
Mourning dove	Zenaidura macroura

Common Name	Scientific Name
Birds (continued)	
Tree swallow	Iridoprocne
Barn swallow	Hirundo rustica
Blue jay	Cyanocitta cristata
Common crow	Corvus brachyrhnchos
Black-capped chickadee	Parus atricapillus
White-breasted nuthatch	Sitta carolinensis
Robin	Turdus migratorius
Starling	Sturnus vulgaris
Slate-colored junco	Junco hyemalis
Various unidentified wood warblers	Parulidae

APPENDIX C

FISH OF THE PORTSMOUTH HARBOR AREA

Table C-1

Finfish Common to the Portsmouth Harbor and General Coastal Area

Common Name	Scientific Name
Yellowtail flounder	*Limanda ferruginea*
Smooth flounder	*Liopsetta putnami*
Winter flounder	*Pseudopleuronectes americanus*
Sand flounder	*Hippoglossoides platessoides*
Four-spot flounder	*Paralichthys oblongus*
Fluke (summer flounder)	*Paralichthys dendatus*
Windowpane	*Scopthalmus aquosus*
Hickory shad	*Alosa mediocris*
Alewife	*Alosa pseudoharengus*
Blueback herring	*Alosa aestivalis*
Atlantic herring	*Clupea harengus harengus*
Northern searobin	*Prionotus carolinus*
Cunner	*Tautoglabrus adspersus*
Atlantic silversides	*Menidia menidia*
Red hake	*Urophycis regius*
Blue hake	*Antimora rostrata*
Silver hake (whiting)	*Merluccius bilinearlis*
White hake	*Urophycis tenuis*
Tautog	*Tautoga onitis*
Atlantic mackerel	*Scomber scombrus*
Sea bass (black)	*Centropristis striata*
Atlantic cod	*Gadus morhua*

Table C-1
(continued)

Common Name	Scientific Name
Striped bass	*Morone saxatilis*
Bluefish	*Pomatomus saltratrix*
Dogfish	*Mustelus canis*
Menhaden	*Brevoortia tyrannus*
Cusk	*Brosme brosme*
Little skate	*Raja erinacea*
Clearnose skate	*Raja eglanteria*
Barndoor skate	*Raja laevis*
Atlantic sturgeon	*Acipenser oxyrhynchus*
Shortnose sturgeon	*Acipenser brevirostrum*
American eel	*Anguilla rostrada*
Rainbow smelt	*Osmerus mordax*
Goosefish	*Lophius americanus*
Fourbeard rockling	*Enchelyopus cimbrius*
Haddock	*Melanogrammus aeglefinus*
Atlantic tomcod	*Microgadus tomcod*
Pollock	*Pollachius virens*
Mummichog	*Fundulus heteroclitus*
Striped killifish	*Fundulus majalis*
Fourspine stickleback	*Apeltes quadracus*
Threespine stickleback	*Gastrosteus aculeatus*
Black spotted stickleback	*Gastrosteus wheatlandi*

Table C-1
(continued)

Common Name	Scientific Name
Ninespine stickleback	*Pungitius pungitius*
Northern pipefish	*Syngnathus fuscus*
Crevalle jack	*Caranx hippos*
Banded killifish	*Seriola zonata*
Striped mullet	*Mugil cephalus*
Radiated shanny	*Ulvaria subbifurcata*
Rock gunnel	*Pholis gunnellus*
Atlantic wolffish	*Anarchicas lupus*
Spotted wolffish	*Anarchicas minor*
American sand lace	*Ammodytes americanus*
Redfish (ocean perch)	*Sebastes marinus*
Sea raven	*Hemitripterus americanus*
Longhorn sculpin	*Myoxocephalus octodecemspinosus*
Shorthorn sculpin	*Myoxocephalus scorplius*
Lumpfish	*Cyclopterus lumpus*
Seasnail	*Liparis atlanticus*
Striped seasnail	*Liparis liparis*
Coho salmon	*Oncorhynchus kisutch*

Table C-2

Benthic Infauna by Substrate Type

Substrate	Organism
Intertidal -- mud and gravel	Polychaetes -- *Nereis*, *Nephtys*
	Molluscs -- *Mya*, *Macoma*, *Mytilus*, *Tellina*
	Gastropods -- *Lacuna*, *Nassarius*
	Amphipods -- *Ampelisca*, *Gammarus*
Harbor -- mud	Echinoderms -- *Echinarachnius*, *Asterias*
	Molluscs -- *Tellina*, *Cerastoderma*, *Anomia*
	Polychaetes -- *Nereis*, *Nephytys*, *Lepidonotus*, *Lumbrineris*
	Crustaceans -- *Ampelisca*, *Corophium*
Harbor -- rocky, shell litter	Hydroids -- *Tubularia*, *Thuiaria*, *Sertularia*
	Bryozoans -- *Callopora*, *Crisia*, *Electra*, *Hippothoa*
	Amphipods -- *Jassa*
	Isopods -- *Idotea*
	Polychaetes -- *Spirorbis*
Harbor -- hard bottom	Hydroids -- *Sertularia*
	Bryozoans -- *Callopora*
	Molluscs -- *Mytilus*, *Modiolus*
	Gastropods -- *Littorina*, *Thais*, *Acmaea*
	Echinoderms -- *Asterias*
	Crustaceans -- *Balanus*

APPENDIX D

ENDANGERED AND THREATENED SPECIES IN MAINE

APPENDIX D

ENDANGERED AND THREATENED SPECIES IN MAINE

Common Name	Scientific Name	Status	Distribution
Fish			
Sturgeon, shortnose[1]	Acipenser brevirostrum	E	Kennebec River and Atlantic Coastal waters
Reptiles			
Turtle, loggerhead[1]	Caretta caretta	T	Oceanic summer resident
Turtle, leatherback[1]	Dermochelys coriacea	E	Oceanic summer resident
Turtle, Atlantic ridley[1]	Lepidochelys kempii	E	Oceanic summer resident
Birds			
Eagle, bald	Haliaeetus leucocephalus	E	Entire state -- nesting habitat
Falcon, American peregrine	Falco peregrinus anatum	E	Entire state -- rees-tablishment to former breeding range is in progress
Falcon, Arctic peregrine	Falco peregrinus tundrius	E	Entire state migratory -- no nesting
Mammals			
Cougar, eastern	Felis concolor cougar	E	Entire state -- may be extinct
Whale, blue[1]	Balaenoptera musculus	E	Oceanic
Whale, finback[1]	Balaenoptera physalus	E	Oceanic
Whale, humpback[1]	Megaptera novaeangliae	E	Oceanic
Whale, right[1]	Eubalaena spp. (all species)	E	Oceanic
Whale, sei[1]	Balaenoptera borealis	E	Oceanic
Whale, sperm[1]	Physeter catodon	E	Oceanic

[1]Except for the sea turtle nesting habitat, the principal responsibility for these species is vested with the National Marine Fisheries Service.

Source: U.S. Fish and Wildlife Service, Region 5

Common Name	Scientific Name	Status	Distribution
Mollusks			
None			
Plants			
Lousewort, Furbish's	*Pedicularis furbishiae*	E	Aroostook County