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Environmental Analysis of the Maritime Administration Ship-Disposal Program

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This environmental analysis has been prepared by the Maritime Administration (MARAD) to analyze the environmental effects of the sale of obsolete vessels from the National Defense Reserve Fleet (NDRF) for scrapping in foreign nations. This analysis has been prepared in response to and fulfills the requirements of Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*. By 1998, MARAD expects to sell 78 vessels. Most will come from the James River Reserve Fleet in Newport News, Virginia, the Beaumont Reserve Fleet in Beaumont, Texas, and the Suisun Bay Reserve Fleet in Benicia, California. Based on sales completed over the past 5 years, MARAD expects that all or most of its sales in the United States will be for scrapping in Mexico, India, and the People's Republic of China. Vessels recently sold for scrapping in Mexico have been taken to a site near the city of Tuxpan. Most vessels recently sold for scrapping in India have been taken to Alang, a remote site on the western shore of the Gulf of Cambay. Vessels recently sold for scrapping in the People's Republic of China have been taken to a number of sites on the east coast of China between the cities of Beijing, Shanghai, and Guangzhou. The reserve fleet and foreign sites, as well as the overseas routes used to transport the vessels, are included in this analysis.

Potential effects on air quality, water quality, and biological resources from the removal of ships from the reserve fleet and their transport to the scrapping sites would be very limited. Air emissions from the engines of tugboats used to transport the obsolete vessels would be minimal in relation to similar emissions from other oceangoing vessels. Any accumulated nonoily water in the obsolete vessels would be discharged at a domestic port prior to oceanic transport. Small quantities of sanitary wastewater could be discharged from the tugboats, but only in compliance with national and international requirements. Initial movement of the vessels from their anchorages at the NDRF sites would disturb any biota which presently use the vessels as habitat. Most hazardous materials have already been removed from the obsolete vessels, but varying quantities of oil and some polychlorinated biphenyls (PCBs) and asbestos that are part of the vessel's basic structure remain on board.

The air, water, and biotic resources in the immediate vicinity of the scrapping sites have been affected in a number of ways by ongoing vessel-breaking activities. However, vessels received from the NDRF sites generally represent only a small part of their total operations. The environmental conditions at these sites would not noticeably change during the period in which ships originating from the

NDRF sites are scrapped. However, some minimal degradation of air and water quality would result from the scrapping of former MARAD ships. Likewise, biotic resources, especially aquatic biota, would be minimally impacted during scrapping operations.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

The Merchant Marine Act of 1936 as amended (46 app. U.S.C. 1160(i)) authorizes the Maritime Administration (MARAD) to dispose of older ships from the National Defense Reserve Fleet (NDRF) as scrap and to acquire newer vessels with the proceeds. In order to raise as much capital as possible, surplus ships are sold to the highest bidder. Due to active competition in the world market, most MARAD ships have been sold for scrapping in foreign nations. In fact, no ships have been sold for scrapping in the United States within the last five years. Since this program represents a major Federal action which has the potential to impact the environment of the receiving nation and the global commons (e.g., the oceans), the provisions of Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, apply. Specifically, MARAD's action falls under Section 2-3, "Actions Included," Subsection (c)(1). According to Section 2-4, "Applicable Procedures," Subsections (a)(iii) and (b)(iii), MARAD must prepare a concise review of the environmental issues resulting from its actions. This document was prepared to fulfill the environmental documentation requirements of the executive order.

In order to gather information for this report a number of sources were used. Literature searches were conducted using online data base services that encompassed several million records in over 15,000 libraries. The following online data bases were used:

- Enviroline
- Dialogue
- Environmental Bibliography
- Online Computer Library Center (OCLC)-
  Online Union Catalog
- Pollution Abstracts
- Water Resources Abstracts
- Waternet
- Oceanic Abstracts
- Aquatic Sciences and Fisheries Abstracts

Data were also received as a result of contacts with numerous domestic and international organizations. These included:

- Embassies of Mexico, India, and the People's Republic of China
- United Nations Missions of Mexico, India, and the People's Republic of China
- World Bank
- International Maritime Organization
- U.S. State Department

- U.S. Department of the Interior
- U.S. Coast Guard
- U.S. Agency for International Development
- Maritime Administration
- Maritime historical societies
- Natural resource agencies in Virginia, Texas, and California

In addition, individuals representing ship brokers, scrapping firms, and overseas tugboat operators were contacted.

This environmental analysis of MARAD's ship-scrapping program is divided into several sections. Section 2.0 describes the program, including ship sales which have occurred over the past 5 years and projected sales for the next 5 years. Section 3.0 describes applicable domestic, foreign, and international laws and regulations. Section 4.0 addresses the general environmental setting of each of the NDRF and foreign scrapping locations, as well as their air quality, water resources, and biotic resources. The ocean environment is also addressed. Impacts of the program on the existing environment are analyzed in Section 5.0. Section 6.0 provides a summary of the environmental analysis. Section 7.0 is a list of references used to prepare the report and Section 8.0 is the list of preparers.

2.0 SHIP SCRAPPING PROGRAM

2.1 INTRODUCTION

This chapter provides an overview of the National Defense Reserve Fleet (NDRF) and the Maritime Administration's (MARAD's) program for scrapping obsolete vessels. The scrapping activities of the previous 5 years, the proposed program for the next 5 years, and the scrapping process are described. Other ship-disposal activities are also summarized.

The Merchant Ship Sales Act of 1946 (50 App. USC Sec 1744) created a government owned and administered NDRF of inactive but potentially useful merchant ships. The MARAD, under the Department of Transportation, is responsible for the preservation and maintenance of the NDRF. This fleet serves as a reserve which can be activated to meet shipping requirements during national emergencies. In 1976, the NDRF was divided into two divisions: (1) a Ready Reserve Fleet (RRF) consisting of ships maintained in a condition that would allow them to be activated within 5, 10, or 20 days and (2) a non-Ready Reserve Fleet (non-RRF) consisting of ships which receive minimal maintenance and would require 30 to 120 days to be activated (1).

Ships in the NDRF are maintained in the most cost-effective way possible. They are preserved by using two technologies: dehumidification of the internal and machinery spaces of the ship, and cathodic protection of the underwater portions of the hull. Dehumidification inhibits the growth of mold and mildew and the corrosion of metal by greatly reducing the airborne level of ambient water vapor. Cathodic protection distributes DC power through anodes to the exterior underwater portions of the hull, resulting in an electric current that suppresses corrosion and preserves the steel. External painting and other cosmetic work are generally deferred due to funding limits (2).

NDRF vessels have supported emergency shipping requirements in seven wars and crises. These include the Berlin crisis, the Korean War, the Vietnam War, and Operation Desert Shield/Desert Storm. In addition, NDRF vessels have been used during tonnage shortfalls to carry coal to Northern Europe and grain to India (2).

At its peak, the NDRF consisted of 2,277 ships (2). These ships were stored at eight different anchorages along the coasts of the Atlantic Ocean, Gulf of Mexico, and Pacific Ocean. Currently, the NDRF consists of 214 ships: 97 RRF and 117 non-RRF ships. Most of these ships are located in three reserve fleets: the James River Reserve Fleet (JRRF), Fort Eustis, Virginia; the Beaumont Reserve Fleet (BRF)

Beaumont, Texas; and the Suisun Bay Reserve Fleet (SBRF), Benicia, California. These fleets contain 63, 42, and 39 ships, respectively (3). The remaining ships are located at various designated outported berths.

The JRRF is located in southeastern Virginia on the James River, approximately 30 miles upstream from its confluence with the Chesapeake Bay at Norfolk, Virginia, and approximately 45 miles from the Atlantic Ocean. The vessels are anchored in a roughly 1-mile segment of the James River adjacent to Fort Eustis.

The BRF is located in southeastern Texas, on the Neches River, immediately southeast of the City of Beaumont. BRF vessels are anchored in a basin north of the Neches River shipping channel, approximately 10 miles west of the City of Port Arthur and the Gulf of Mexico.

The SBRF site is located in west-central California on Suisun Bay, northeast of San Francisco Bay, immediately northeast of the City of Benicia. SBRF vessels are anchored in southwest Suisun Bay north of Army Point and the Carquinez Strait.

All three fleets are similar in organization. Ships are typically anchored in rows in a bow-to-stern fashion. Ships of the same type and size are usually anchored together. Fleet superintendents, who are MARAD employees, are responsible for the inspection, maintenance, and monitoring of the ships (4).

In 1991, the U.S. Environmental Protection Agency (EPA) inspected the SBRF for environmental compliance. The EPA found that Resource Conservation and Recovery Act (RCRA) regulated hazardous wastes and unidentified chemicals were stored improperly on many of the ships. MARAD and the EPA entered into a Memorandum of Understanding, in which MARAD agreed to clean up the SBRF ships (5). To comply with the Memorandum of Understanding, MARAD implemented a Reserve Fleet Hazardous Material Action Plan (Action Plan) (6). This plan included not only the SBRF but also the JRRF and BRF. A complete inventory of hazardous wastes located shipboard and shoreside was taken. From this inventory, MARAD determined which materials were potentially hazardous or obsolete and disposed of them in an EPA-approved manner. Unidentified materials were analyzed by contract-approved firms. In addition, MARAD instituted policies to ensure the fleets remained in compliance with RCRA. Some of these policies included: all items retained aboard ships would be inventoried, stowed, labeled, and contained; containers would be inspected annually for deterioration; shoreside facilities would be established as needed; and all new ships entering the fleet would be required to be free of hazardous materials not inherent to the ship structure.

2.2 PROGRAM DESCRIPTION

2.2.1 Program Background

The Merchant Marine Act of 1936 as amended (46 app. USC 1160 (i)) authorizes MARAD to dispose of older ships in order to acquire newer, larger ships for the NDRF. Until recently, this legislation authorized the Secretary of Transportation to acquire newer vessels in direct exchange for obsolete reserve fleet vessels at their respective scrap values. Because this simultaneous exchange did not fully maximize the return to the government, Section 510(i) was amended in November 1990 (P.L. 101-595) to permit MARAD to dispose of obsolete NDRF vessels when scrap prices are high. The money obtained from the sale of obsolete vessels is placed in the Vessel Operations Revolving Fund, which is used to acquire militarily useful vessels for NDRF in a more timely manner.

In the past 5 years, MARAD has sold 75 ships for scrapping. Table 2-1 shows the number and tonnage (both light ship weight (LSW) and dead weight tons (DWT)) of ships sold. LSW is the weight of the ship excluding cargo, fuel, temporary ballast, and stores. DWT is the weight of the ship when loaded to capacity. Ship scrappers have up to 2 years to dispose of ships purchased from MARAD; currently, 31 of the 75 ships sold between 1989 and 1993 have not been scrapped.

Table 2-1. MARAD Ships Sold for Scrapping from 1989 to 1993

Year	Number of Ships	LSW (tons)	DWT (tons)
1989	4	24,657	45,114
1990	0	0	0
1991	10	71,408	118,217
1992	23	105,576	242,247
1993	38	172,713	393,946
Total	75	374,354	799,524

Source: 7

The tonnage of MARAD ships sold for scrapping in the past 5 years represents a very small percentage of the world market. Figure 2-1 compares the DWT of MARAD ships sold for scrapping from 1989 to 1993 to the DWT of ships sold worldwide. The highest percentage of the worldwide scrapping market that MARAD ships represented was 3 percent in 1991 (7,8,9,10).

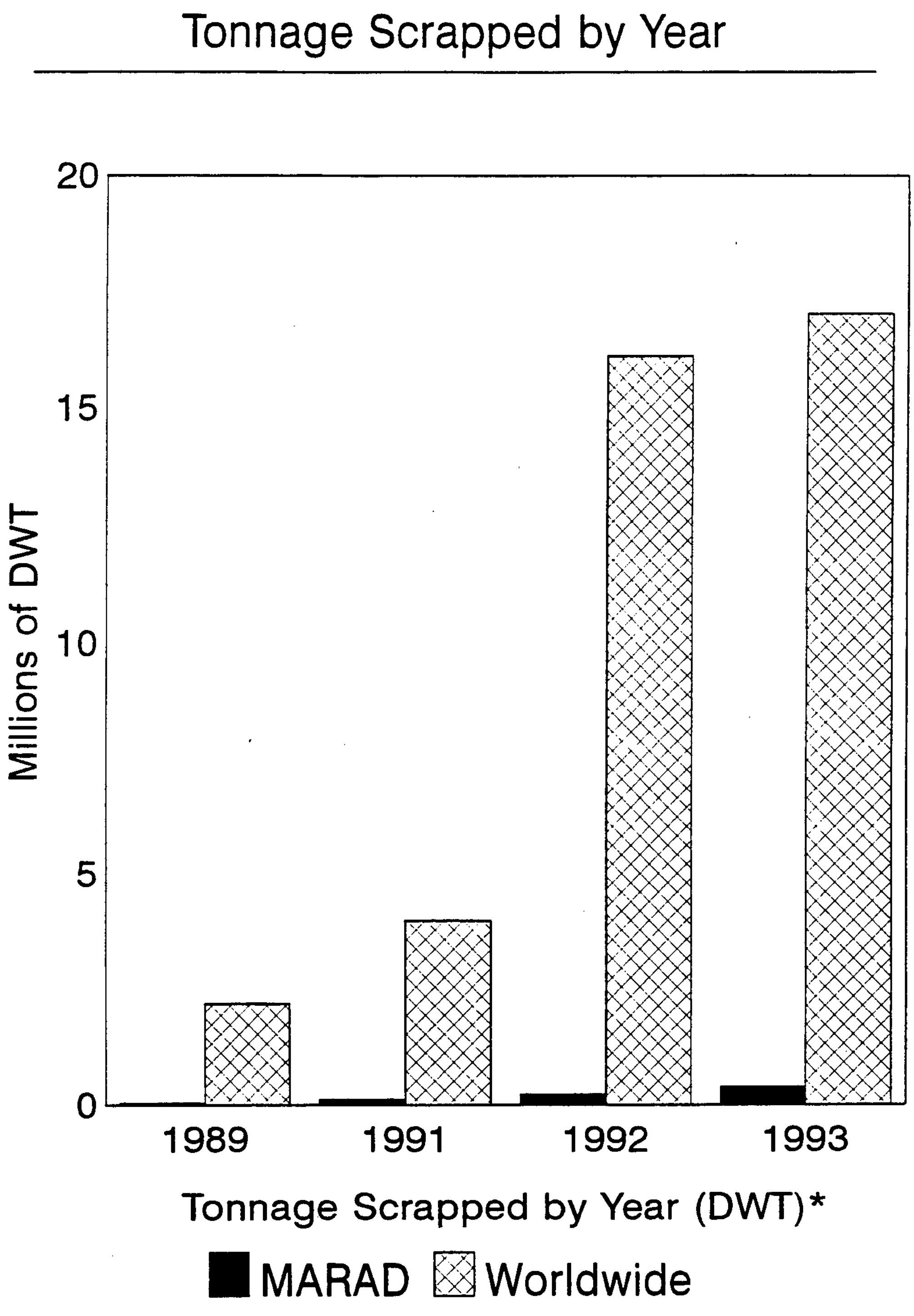
Seventy-three of the ships sold for scrapping between 1989 and 1993 were sold to Mexico, India, and the People's Republic of China. The other two ships have not yet been delivered, and their designated scrapping locations are unknown at this time. Table 2-2 shows the number of ships and the LSW tonnage purchased from MARAD for scrapping in Mexico, India, and the People's Republic of China.

Table 2-2. MARAD Ships Sold for Scrapping in Mexico, India, and the People's Republic of China

Country	Mexico		People's Republic of China		India	
Year	No. of Ships	LSW (tons)	No. of Ships	LSW (tons)	No. of Ships	LSW (tons)
1989	0	0	0	0	4	24,657
1990	0	0	0	0	0	0
1991	4	22,256	0	0	6	49,152
1992	0	0	6	26,927	16	73,155
1993	4	18,101	18	79,466	15	73,245
Total	8	40,357	24	106,393	41	220,209

Source: 7

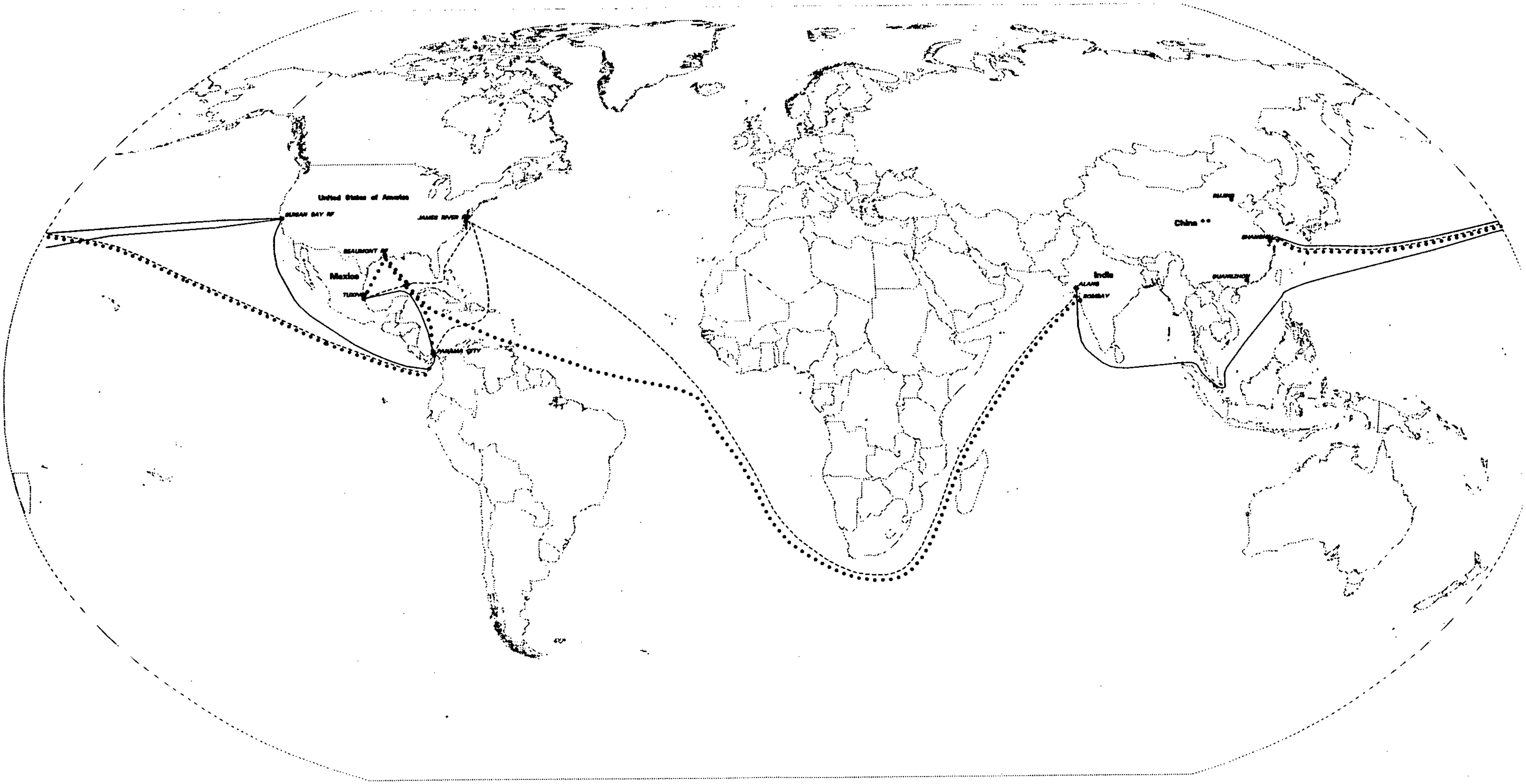
In the past 5 years, eight MARAD vessels were sold for scrapping in Tuxpan, Mexico. This represents 11 percent of the total LSW tonnage sold for scrapping by MARAD from 1989 to 1993. All of these ships were sold from the BRF. Because the BRF is the closest fleet to the Tuxpan site (Figure 2-2), vessels sold from the BRF are likely to continue to be scrapped at that location. It is very unlikely that ships from the JRRF or SBRF would be sold for scrapping in Mexico because of the expense of



*MARAD did not sell any ships in 1990

Source: MARAD, 1994f; Drewery Shipping Consultants, 1991, 1993, 1994

Figure 2-1. MARAD 5-Year Scrap Tonnage Sales Versus Worldwide Scrap Tonnage



APPROXIMATE INTERPORT DISTANCE IN NAUTICAL MILES (NM)

ORIGINATING PORT	TUXPAN, MEXICO	SHANGHAI, CHINA**	ALANG, INDIA
BEAUMONT RESERVE FLEET	590	10,120	12,230
JAMES RIVER RESERVE FLEET	1,790	10,390	11,570
SUISAN BAY RESERVE FLEET	4,730	5,390	9,790

** - Shanghai is the representative location for the east coast of China.

Figure 2-2: Approximate Shipping Routes Between MARAD Reserve Fleets and Scrapping Locations

Approximate Graphic Scale at the Equator: 1 in = 1600 miles

SHIPPING ROUTE LEGEND
- ——— Suisan Bay RF (CA)
- - - - - James River RF (VA)
- • • • • • Beaumont RF (TX)

transportation. Currently, only five NDRF ships and four Navy ships which are candidates for scrapping are anchored at Beaumont; therefore, the number of MARAD ships sold for scrapping in Mexico in the next 5 years will probably be limited.

India has scrapped former MARAD ships near the cities of Alang and Bombay. The majority of the tonnage sold to India (95 percent) went to the Alang site; therefore, the environmental discussion presented in the following sections focuses on Alang. India is listed by *Shipping Statistics and Economics* as one of the principal ship-scrapping countries. Typically, smaller ships are scrapped in India, (i.e., under 10,000 light displacement tons, a measurement similar to LSW); thus, MARAD ships are ideal scrapping candidates (9). In the past 5 years, India has disposed of the majority of former MARAD ships. Forty-one vessels, weighing 220,209 LSW tons, or 59 percent of the total tonnage sold from 1989 to 1993, have been purchased for scrapping in India. India will probably continue to be a major scrapping site for former MARAD ships.

Ships sold for scrapping in the People's Republic of China were taken to locations along the east coast generally between the cities of Beijing, Shanghai, and Guangzhou. There are over 150 scrapping sites in China (12). The People's Republic of China, like India, is one of the world's principal ship-scrapping countries. In the past 2 years, 24 former MARAD ships have been scrapped in the People's Republic of China. This represents approximately 28 percent of the LSW tons sold by MARAD. Although fewer former MARAD ships were scrapped in the People's Republic of China than India since 1989, China has been more active in this regard since 1993. It is difficult to predict whether this trend will continue.

2.2.2 Proposed Program

In October 1991, the U.S. General Accounting Office (GAO) issued a report to Congressional requesters entitled "Strategic Sealift, Part of the National Defense Reserve Fleet Is No Longer Needed" (1). This report recommended that MARAD accelerate its scrapping of older NDRF ships. In concurrence with the report, Congress has directed MARAD to accelerate the scrapping of the older, obsolete ships in the NDRF.

It is projected that a total of 78 vessels will be available to be sold for scrapping over the next 5 years. Of the 78 vessels, 48 are currently in the NDRF and 30 will be transferred from the Navy. The process for selling the ships will likely remain the same as in the past 5 years.

Table 2-3 shows MARAD's 5-year sales projection for obsolete ships.

Table 2-3. MARAD Five-Year Sales Projection

Year	1994	1995	1996	1997	1998
NDRF Ships	24	24	0	0	0
Navy Ships	0	0	12	12	6
Total	24	24	12	12	6

Source: 13

Although 24 ships are projected to be sold in 1994, a total of 28 are potentially available for sale. The average LSW of the 28 ships potentially available for sale in 1994 is 6,510.6 tons. Of the 28 ships, 12 are in the JRRF, 3 are in the BRF, and 13 are in the SBRF (11).

It is likely that Mexico, India, and the People's Republic of China will continue to be major scrapping locations for these ships. However, former MARAD ships could be scrapped in other countries such as Pakistan and Bangladesh.

The tonnage of ships scrapped worldwide has increased annually for the past 5 years. The biggest increase was from 3,993,000 DWT in 1991 to 16,095,000 DWT in 1992, a 303.1 percent increase. This increase was due primarily to a major upturn in scrap prices. The smallest percentage increase (5.7 percent) occurred from 1992 to 1993, when the tonnage sold for scrap increased from 16,095,000 DWT tons to 17,010,000 DWT tons (8,9,10).

The amount of scrap sold per year is dependent primarily on scrap prices and is difficult to predict. If scrap prices continue to rise, so will the number of ships sold for scrapping. In January 1994, 2 million DWT of vessels were sold for scrap. This amount was exceeded only twice in 1993 (10). In the first quarter of 1994, scrap tonnage purchased by the People's Republic of China was down 30 percent, while India and Bangladesh almost doubled their acquisitions with 362,440 LDT and 212,865 LDT, respectively. Currently, India represents 70 percent of the scrap vessel market and is aggressively seeking more tonnage (14). If this trend continues, India will probably continue to be the major scrapping location for former MARAD ships.

In 1994, MARAD plans to sell ships totaling approximately 182,000 LSW tons for scrapping; this is also a realistic projection for 1995. This figure is only slightly higher than the 1993 value of 172,713 LSW tons. Barring extreme changes in the market, MARAD's scrapping program should represent no more than 3 percent of the worldwide scrapping tonnage in 1994 and 1995.

From 1996 through 1998, MARAD plans to scrap Navy transfer ships. Although Navy ships tend to be larger than NDRF ships, the number of ships scrapped will be fewer and the tonnage sold by MARAD will be less in those years than in 1994 and 1995.

2.2.3 Scrapping Process

Fleet superintendents recommend which ships are no longer assets to the reserve fleet. The age, physical condition, usefulness for parts, and physical location of the ship in the fleet (e.g., ships on the end of a row are easier to remove) are taken into account when determining which ships could be sold for scrapping. The recommendations of fleet superintendents are reviewed by the Chief of the Reserve Fleet Division (MARAD) and the Chief of Logistics (Department of Defense). The Director of the Office of Ship Operations makes the final decision as to which ships to sell. The obsolete ships to be sold are usually advertised in groups of 4 to 12; however, prospective buyers may purchase the ships either in groups or individually (4).

Once a determination has been made as to which ships to offer for sale, an independent contractor determines the LSW for each ship. The LSW is usually measured in tons. Steel is a major weight component of the LSW and provides an estimate of the worth of the ship. An invitation for bid is then issued (15).

The bidding period typically lasts 6 weeks. Foreign and domestic scrappers submit sealed competitive bids. All bids must be submitted with a 10 percent deposit. Vessels may be sold for scrapping in any country with the exception of Albania, Bulgaria, Estonia, Laos, Latvia, Lithuania, Mongolian People's Republic, North Korea, Vietnam, Cambodia, Libya, Cuba, Iraq, or the geographic area formerly known as the Union of Soviet Socialist Republics. Bidders are encouraged to inspect the ships they are bidding on and can perform their own LSW determination.

Once the bidding period is over, MARAD awards the ships to the highest bidders. If none of the bids are deemed high enough, MARAD has the authority reject them. Once a ship is sold, the purchaser has 60 days to remove it from the fleet (this time period may be extended if more than one ship is purchased) and an additional 2 years to scrap it.

In the past, buyers intending to scrap vessels in Mexico, India, and the People's Republic of China have typically offered the highest bids, whereas American scrappers typically offered the lowest bids. Buyers from Mexico, India, and the People's Republic of China can offer significantly higher bids than American scrappers because of the availability of cheap labor and less comprehensive environmental and labor regulations.

Once a ship is sold, the buyer usually contracts with a private firm to remove the ship from the fleet and to prepare it for tow. In accordance with the Action Plan, before the ship is removed, MARAD employees perform an inspection to ensure that there are no hazardous materials on board which are not inherent to the structure of the ship. Many of the ships sold for scrapping have hazardous materials such as polychlorinated biphenyls (PCBs) and asbestos in their structure. In addition, many of the ships also have up to 1200 tons (337,680 gallons) of unused fuel oil on board (16,17). The invitation for bid states that these materials exist and notes that if the ships are scrapped at foreign locations, provisions apprising of United States requirements for protection from these materials are advisory in nature.

Once a ship has passed the hazardous materials inspection, a MARAD employee frees the ship from its moorings and the buyer can remove it. Ships are typically towed to a nearby dock and prepared for transport overseas. Any residual water that may have rained or leaked into the ship is removed. This enables the tug operator to determine if the ship has developed a leak during transportation to the disposal location. If the water to be removed is visually determined to contain oil, the water is pumped into containers on board. These containers are left on board when the ship is transported to the scrapping location. Water not contaminated with oil is pumped overboard. An electric air compressor is typically used to run the pump. The ship's propeller is secured during towing. The rudder is positioned parallel with the ship and the steering mechanism is secured in place with brackets. Wooden hatches are sealed with tarps and metal hatches are sealed with foam. All loose materials and booms are secured. Occasionally, water is pumped into the ship for additional ballast. Battery-operated running lights are placed on board. When the ship is ready for tow, the U.S. Coast Guard inspects it to ensure it meets the applicable requirements of the Safety of Life at Sea Convention (17).

Tugs are used to transport ships to their destinations. For economic reasons, tugs typically will pull two vessels simultaneously. An 8,500-horsepower tug can tow two vessels at speeds of 5 to 6 knots and uses 10 tons of fuel per day

(17,18). For the longest towing distance, Beaumont, Texas, to Alang, India (Figure 2-1), a tug would require approximately 100 days to reach its destination and would burn approximately 1000 tons of fuel. For the shortest distance, Beaumont, Texas, to Tuxpan, Mexico, a tug would require approximately 5 days to reach its destination and would burn approximately 50 tons of fuel.

When a ship has reached the scrapping location, it may be anchored offshore for up to 2 years after purchase; however, the scrapping process usually begins within a month. In India, the government owns a long strip of beach near Alang which is used for scrapping activities. Eighty vessels can be scrapped simultaneously. Scrapping companies lease ship-breaking "lots" from the government. Once a ship is beached, a government environmental employee and, if the ship is a tanker, a chemist inspect the ship. government personnel inspect for flammable/explosive substances which could present a hazard during cutting operations. The inspectors also check for hazardous materials such as PCBs and asbestos. Hazardous materials must be disposed of properly. In India, PCB-impregnated materials and asbestos are placed in polyethylene-lined bags and disposed of in a landfill about 60 miles from the scrapping site. The landfill officials record the amount of hazardous materials brought there (19).

Once a ship is deemed safe for cutting operations, the scrapping process begins. At high tide, the ship is driven as close to the beach as the ship's draft will allow. Workers dismantle the ship using oxyacetylene torches, hand tools, and cranes. The workers begin at the top deck of the ship and work down to the hull. Occasionally, a ship's draft is too large to allow the ship to be successfully beached. When this happens, large pieces are cut from the ship using oxyacetylene torches, placed in the water, and pulled to shore where workers break them into smaller units. The smaller pieces of the ship are loaded onto pontoon rafts and pulled to shore. As the ship becomes lighter, the ship's draft decreases and the workers are able to pull it closer to shore. This process continues until the ship is finally beached and completely dismantled (19). Approximately 30 men working 10-hour shifts can dismantle a 5000-ton-LSW vessel in about 30 days (18).

Tuxpan, Mexico, has somewhat more sophisticated methods of scrapping than Alang. Vessels are directed into a man-made canal parallel to the Tuxpan River. This canal has been specifically created to service the scrapping operation. The ships are dismantled mechanically, one at a time, using cranes while the vessels remain floating in the canal. Large pieces of the vessels are transferred to a workyard abutting the canal, where they are manually broken into smaller units and loaded onto trucks for transport to a nearby mill. The operation employs about 60 workers. No large-scale expansion of the operation is presently expected, although as much as a 15 percent increase in the scrapping rate is anticipated through increases in efficiency (20).

In the People's Republic of China all scrapping companies are owned by the government. There are over 150 scrapping locations within the country. The method used for breaking a ship varies depending upon location and the size of the ship. Ships may be scrapped by driving them onto the beach, tying them alongside a pier, or placing them in a drydock. Due to the smaller size of MARAD ships, they are usually broken by tying them alongside a pier. Certain precautions are taken to avoid contamination of the environment. PCBs are drained from equipment, placed in drums, and removed from the ship. PCBs are either incinerated or sent to a recycling center for reuse. Asbestos is sprayed with water before removal, collected in plastic bags, and sent to a recycling company. Oil is removed and may be used as fuel. Booms are placed around ships to prevent any spilled oil from spreading beyond the scrapping site (12).

Virtually everything salvaged from a ship is recycled. Metal is transported to mills where the larger pieces are rerolled and the smaller pieces are melted down. Wood, electronic equipment, piping, kitchen materials, and miscellaneous other items are reused or sold to dealers. Oil remaining onboard is either sold or used to run equipment in the scrapping operation.

Once a ship has been completely dismantled, the ship breaker must provide documentation to MARAD that the ship was disposed of properly, that it was dismantled within 24 months of purchase, and that no parts were sold to restricted countries. This document is known as an affidavit of compliance and must be duly attested to and authenticated by a U.S. Consul in the country in which the vessel was scrapped. Upon receipt of the affidavit, MARAD returns a $75,000 surety obtained at the time of the ship's purchase.

2.3 OTHER SHIP-DISPOSAL ACTIVITIES

In addition to scrapping, some obsolete vessels are used in the MARAD Artificial Reef Program or as maritime museums. The Artificial Reef Program, which was established in 1972 under Public Law 92-402, permits the Secretary of Transportation to transfer obsolete Liberty ships in the NDRF to any state which meets the requirements set forth by law. The law provides that the transfer be at no cost to the government and that the state take custody of the vessel "as-is-where-is." In addition, it permits states to strip the ship of salvageable materials to offset the costs of towing, preparation, and sinking. In 1984, the program was amended by Public Law 98-623, which extends the program to all obsolete ships in the NDRF. To date, a total of 51 vessels have been transferred to 10 states under this program. The states that have received ships and the number received are: Texas-12; Florida-10; North Carolina-7; Virginia-6; Alabama-5; Mississippi-5; Georgia-2; South Carolina-2; California-1; and New Jersey-1 (2).

Historical societies specializing in merchant mariner museums are familiar with the ships in the NDRF and MARAD's scrapping program. Ships scrapped in the past 5 years which could be considered historically valuable were primarily World War II Victory and Liberty ships. Liberty and Victory ships were used to transport munitions, ordnance, and other supplies.

If a historical society believes that an NDRF ship is historically valuable, it can seek to have a law introduced to have it turned over to the society. Private Law 100-21 and Public Law 98-133 authorized the Secretary of Transportation to convey a Victory ship and a Liberty ship, the LANE VICTORY and the JOHN BROWN, respectively, to nonprofit organizations on an as-is-where-is basis at no cost to the government. The JOHN BROWN is currently on display in Baltimore, Maryland, while the LANE VICTORY is on display near San Francisco, California. These ships are to be returned to MARAD when they are no longer used as museums (21).

Historically valuable ships can also be turned over to the National Park Service. The JEREMIAH O'BRIEN, a Liberty ship, is chartered to the National Park Service to be used as an educational and recreational facility for the benefit of the people of California.

There is considerable cost associated with the maintenance of a ship for use as a museum. In order to support ships currently used as maritime museums, nonprofit organizations recently succeeded in obtaining special legislation which required MARAD to convey 10 ships from the NDRF to these organizations. The ships will be sold for scrapping, and the money obtained will be used to support the merchant mariner museums.

3.0 DOMESTIC, FOREIGN, AND INTERNATIONAL LAWS

3.1 INTRODUCTION

This chapter provides information on the relevant sections of applicable regulations used in the assessment of the environmental impacts of the Maritime Administration's (MARAD's) Ship Scrapping Program. Section 3.2 includes a discussion of each Executive Order and Federal statute and its applicability to the ship-scrapping program. A discussion of environmental regulations of Virginia, Texas, and California is included, as appropriate. Section 3.3 addresses laws and regulations of the three countries in which former MARAD ships have been scrapped in the last 5 years. These countries are Mexico, India, and the People's Republic of China. Section 3.4 discusses applicable international laws and conventions.

3.2 DOMESTIC LAWS AND REGULATIONS

This section addresses Executive Orders and Federal statues, and applicable state regulations. The applicability of the various regulations to MARAD's ship-scrapping program is also discussed.

3.2.1 Executive Order 11593, Protection and Enhancement of the Cultural Environment (1971)

Executive Order 11593 requires Federal agencies to locate, inventory, and nominate to the *National Register of Historic Places* qualifying properties under their jurisdiction or control. This process requires Federal agencies to provide the Advisory Council on Historic Preservation with the opportunity to comment on the possible impacts of a proposed activity on any potentially eligible or listed historic resource.

Executive Order 11593 requires a list of vessels that are places of national historic importance to be maintained, and to nominate other vessels that may qualify as places of national historic importance. The Advisory Council on Historic Preservation must be allowed the opportunity to comment if potentially eligible or listed historic vessels are to be modified or scrapped.

3.2.2 Executive Order 12088, Federal Compliance with Pollution Control Standards (1978)

Federal agencies are responsible for the prevention, control, and abatement of environmental pollution from facilities and activities under their control and for compliance with applicable pollution control standards.

Executive Order 12088 requires environmental pollution from any MARAD facility, vessel, and activity to be prevented, controlled, and abated.

3.2.3 Executive Order 12114, Environmental Effects Abroad of Major Federal Actions (1979)

Executive Order 12114 requires that officials of Federal agencies having the responsibility for authorizing and approving major Federal actions significantly affecting the environment of a foreign nation or the global commons (e.g., oceans) be informed of pertinent environmental considerations, and take those considerations into account with other pertinent national policy considerations when making decisions regarding major actions.

3.2.4 Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements (1993)

Executive Order 12856 requires that the head of each Federal agency be responsible for ensuring that all necessary actions are taken for the prevention of pollution with respect to the agency's activities and facilities. The head of each Federal agency also is responsible for ensuring that the agency complies with pollution prevention, emergency planning, and community right-to-know provisions established pursuant to the Pollution Prevention Act (42 USC 13101 et seq.) and the Emergency Planning and Community Right-to-Know Act (42 USC 11001 et seq.), an amendment to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

3.2.5 Bald and Golden Eagle Protection Act (16 USC 668 et seq.)

The Bald and Golden Eagle Protection Act makes it illegal to take, pursue, molest, or disturb American bald and golden eagles, their nests, or their eggs anywhere in the United States. A permit from the U.S. Department of Interior (DOI) is required to relocate a nest if the area in which it is located is necessary for resource development. If a nest is found in the vicinity of the site of a proposed action, the Federal agency initiating the proposed action must consult with the DOI regarding proper procedures under this Act. American bald eagles also are protected under the Endangered Species Act.

If an American bald or golden eagle establishes a nest on or near a vessel that is to be moved, consultation with the DOI is required regarding proper procedures before moving the vessel containing the nest, or vessels adjacent to the site of the nest.

3.2.6 Clean Air Act (42 USC 7401 et seq.)

The Clean Air Act (CAA) is intended to protect and enhance the nation's air resources in order to promote public health and welfare and the productive capabilities of its population. In November 1990, the CAA was amended by the CAA Amendments. Three sets of Federal criteria regulating air quality and air emissions are established under the CAA and the CAA Amendments. They include:

- National Ambient Air Quality Standards (NAAQS)
- Prevention of Significant Deterioration (PSD)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)

The NAAQS (40 CFR 50) set health- and welfare-based air quality standards for six criteria pollutants that pose the greatest overall threat to air quality in the United States. At the present time, the criteria pollutants are ozone, carbon monoxide, sulfur dioxide, lead, nitrogen dioxide, and particulate matter smaller than or equal to 10 microns, referred to as PM_{10}.

The CAA gave the U.S. Environmental Protection Agency (EPA) the authority to designate counties and Metropolitan Statistical Areas that do not meet the NAAQS as nonattainment areas. If an area is designated as a nonattainment area, it must achieve the NAAQS by a specified date based on the concentration of the pollutant in the air. The CAA Amendments establish NESHAPs which set air quality standards for eight of the 189 hazardous air pollutants (HAPs). Any stationary source that will emit any of the eight pollutants regulated by the NESHAPs must meet the standards established for those pollutants.

The EPA is in the process of establishing Maximum Achievable Control Technology standards for the 189 HAPs. Once the EPA imposes technology-based standards, it will consider the residual risks to the public. Asbestos is an HAP. The EPA has promulgated emission standards for the manufacture, fabrication, spray application, waste packaging, demolition and renovation, and disposal of asbestos. None of these standards are applicable to undisturbed asbestos.

Section 110 of the CAA Amendments requires states to develop and submit State Implementation Plans to the EPA that outline measures for implementing, maintaining, and enforcing the NAAQS. Compliance with air pollutant emission regulations is enforced by state regulatory authorities, which require that construction/operation permits be obtained for any new or modified facilities that emit regulated pollutants. Individual states or regional authorities may impose emission restrictions that are more stringent than the CAA. Many states have established air quality standards for criteria pollutants that are more stringent than the NAAQS. States may also control air quality through construction/operation permits. While Federal emissions criteria have been established for only eight HAPs, many states have criteria for additional ones.

MARAD must comply with the air quality standards established by the CAA and the CAA Amendments, as well as with state air quality standards established pursuant to Section 110 of the CAA Amendments. Virginia, Texas, and California have established air quality standards pursuant to Section 110. Currently, there are no regulations that regulate emissions from ships (22).

3.2.7 Clean Water Act (33 USC 1251 et seq.)

The Clean Water Act (CWA), as amended by the Water Quality Act of 1987, is designed to restore and maintain the chemical, physical, and biological integrity of surface waters. Under the CWA, it is illegal to discharge pollutants from a point source into the navigable waters of the United States, including interstate and intrastate lakes, rivers, streams, wetlands, playa lakes, prairie potholes, mudflats, seasonal streams, and wet meadows, except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit.

The Oil Pollution Prevention Regulations (40 CFR 112), issued under Section 311 of the CWA as amended by the Oil Pollution Act, require the preparation of Spill Prevention, Control, and Countermeasures (SPCC) plans to prevent the accidental release of oil into surface waters or onto adjoining shorelines. Most SPCC plans also include best management practices designed to prevent the accidental release of other hazardous substances.

Under the CWA, states establish water quality standards and have the ability to establish NPDES permits requirements that are more stringent than the respective Federal permits. States may also have requirements other than SPCC for the storage of oil.

Discharges of effluent from properly operating marine engines and other discharges associated with normal operations do not require NPDES permits. An SPCC plan is required for compliance with the oil pollution regulations if a vessel which is designated for nontransportational uses is being used to store more than 1,320 gallons of oil. Compliance with state requirements may also be necessary.

3.2.8 Comprehensive Environmental Response,Compensation and Liability Act (42 USC 9601 et seq.)

CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the Omnibus Budget Reconciliation Act of 1990, was enacted to provide both emergency response by the Federal government for hazardous substances accidentally released into the environment and cleanup of inactive waste disposal sites. The act is commonly referred to as Superfund.

Section 103 of CERCLA includes requirements for reporting to the National Response Center any releases of hazardous substances into the environment. Section 104 of CERCLA authorizes the EPA or the state to initiate a removal action for releases or substantial threat of releases of hazardous substances, or for releases or threat of release of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare. Section 106 of CERCLA provides the EPA the authority to order responsible parties to conduct a remedial investigation/feasibility study and cleanup for releases or threatened releases of hazardous substances. Under Section 107 of CERCLA, certain parties are held liable for response costs and other costs related to accessing and responding to a waste site.

Both polychlorinated biphenyls (PCBs) and asbestos are hazardous substances under CERCLA. If there is a release of PCBs or asbestos (friable forms only) into the environment in an amount equal to or exceeding the reportable quantity in a 24-hour period, the release must immediately be reported to the National Response Center.

3.2.9 Emergency Planning and Community Right-to-Known Act (42 USC 11007 et seq.)

The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), also known as SARA Title III, is a free-standing act within the Superfund Amendments and Reauthorization Act. It contains four major provisions: emergency planning and preparedness, emergency release notification, community right-to-know reporting, and toxic chemical release reporting (emissions inventory).

The emergency planning sections are designed to develop state and local governments' emergency response and preparedness capabilities. It is through this act that State Emergency Response Commissions (SERC) and Local Emergency Planning Committees (LEPC) are established. The LEPC is required to develop an emergency response plan. Facilities that have released hazardous substances and extremely hazardous substances are required to notify both the SERC and the LEPC. Under the community right-to-know requirements, facilities must submit to the SERC, the LEPC, and the local fire department material safety data sheets for the hazardous substances used. Additionally, facilities must submit annual inventories on the same hazardous chemicals to these agencies. EPCRA requires facilities that manufacture, process, or use toxic substances over threshold limits to report those quantities annually to the EPA and the state.

Neither PCBs nor asbestos is considered extremely hazardous substances under SARA Title III. However, both PCBs and asbestos (friable forms only) are toxic chemicals and thus may be subject to toxic chemical release reporting.

3.2.10 Endangered Species Act (16 USC 1531 et seq.)

The Endangered Species Act is intended to protect and, if possible, restore species of animals and plants that are endangered or threatened with extinction. Section 7 of the Act requires all Federal agencies undertaking a project to consult with the Fish and Wildlife Service (FWS) and/or the National Marine Fisheries Service (NMFS) to determine if the action could jeopardize the continued existence of any threatened or endangered species or result in the destruction of critical habitat for such species.

States may develop their own threatened and endangered species list. Unless the state has a endangered species regulations, the list does not provide protection for the species. Virginia, Texas, and California have endangered species regulations. Thus, consultation with applicable state departments may be necessary before undertaking any project.

If actions relating to the reserve fleet could impact a Federal or state-listed threatened or endangered species, consultation with the FWS or NMFS and/or appropriate state agency would be required. Mitigation measures would have to be developed in cooperation with these agencies to ensure the protection of the listed species.

3.2.11 Federal Facility Compliance Act (42 USC 6901 et seq.)

The Federal Facility Compliance Act (FFCA) amends the Solid Waste Disposal Act (see discussion on Resource Conservation and Recovery Act (RCRA) below) to clarify provisions concerning the application of certain requirements and sanctions to Federal facilities. The FFCA gives any state that has an authorized hazardous waste program the authority to conduct an inspection of any facilities which manage hazardous waste, including Federal facilities, for the purpose of enforcing the facilities' compliance with the state's program. Any funds received by the state from Federal facilities must be used to improve hazardous waste facilities, protect the environment, or defray the costs of enforcement if these funds have not already been allocated a use by the state's Constitution.

Section 106 of the FFCA sets forth requirements for hazardous wastes generated on public vessels while at sea. Public vessels are vessels owned or bareboat chartered and operated by the United States, or by a foreign nation, except when the vessel is engaged in commerce. This section regulates the wastes generated on board a vessel.

If any hazardous waste is managed or stored on any vessel or at any facility, and the state where the vessels or facilities are located has an authorized hazardous waste program, the state has the authority to inspect the vessels or facilities to ensure that the hazardous waste is being stored in a manner that complies with state's program.

3.2.12 Migratory Bird Treaty Act (16 USC 703 et seq.)

The Migratory Bird Treaty Act is intended to protect birds that have common migration patterns among the United States, Canada, Mexico, Japan, and the former Soviet Union. The Act makes it illegal to kill any migratory bird or disturb nests or eggs, except as permitted by the Act.

If migratory bird establishes a nest on or near a vessel that is to be sold for scrapping, consultation with the DOI is required regarding proper procedures before moving the vessel containing the nest, or vessels adjacent to the site of the nest.

3.2.13 National Historic Preservation Act (16 USC 470 et seq.)

The National Historic Preservation Act (NHPA) requires that places of national historic importance be included on the National Register of Historic Places. Under NHPA, the officials of Federal agencies must assume responsibility for the preservation of historic properties owned or controlled by their agencies. Each agency must undertake the preservation of such properties and initiate measures to ensure that when a historic property is altered substantially or demolished, steps are taken to have appropriate records made.

Under NHPA, the preservation of any vessel that is listed or eligible for listing on the National Register of Historic Places is required. If the vessel listed or eligible for listing is to be modified or scrapped, under Section 106 of

NHPA it is necessary to consult with the State Historic Preservation Officer and take steps to have appropriate records made.

3.2.14 Prevention of Pollution from Ships Act (33 USC 1901 et seq.)

The Prevention of Pollution from Ships Act incorporates the requirements for preventing pollution from ships as stated in the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (MARPOL) into U.S. law. Section 3.4.2 discusses MARPOL and its applicability to MARAD's ship-scrapping program.

3.2.15 Resource Conservation and Recovery Act (42 USC 6901 et seq.)

RCRA was enacted as an amendment to the Solid Waste Disposal Act. RCRA has been amended by several laws, including the Used Oil Recycling Act, the Hazardous and Solid Waste Amendments, and FFCA. The primary goals of RCRA are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

Subtitle C of RCRA regulates hazardous waste from "cradle to grave." Under Subtitle C, the generation, transportation, treatment, storage, and disposal of hazardous waste are regulated. Subtitle D of RCRA regulates the management of nonhazardous solid waste. Subtitle I of RCRA regulates underground storage tanks containing petroleum and hazardous substances.

Both solid waste and hazardous waste are defined under RCRA Subtitle C. A material is a solid waste if it is abandoned by being disposed of; burned or incinerated; or accumulated, stored, or treated before or in place of being abandoned by disposal, burning, or incineration. A solid waste that exhibits a characteristic of a hazardous waste or meets any of the hazardous waste listing descriptions is also a hazardous waste and is subject to regulation under RCRA Subtitle C.

Certain recyclable materials are exempt from regulation under RCRA Subtitle C. Scrap metal that is recycled is considered an exempt recyclable material. Under RCRA, scrap metal is defined as "bits and pieces of metal parts or metal pieces that may be combined together with bolts or soldering (e.g., radiators, scrap automobiles, railroad box cars), which when worn or superfluous can be recycled."

Under Federal RCRA regulations, neither PCBs nor asbestos is considered hazardous waste unless they exhibit a defined characteristic for toxicity; therefore, these materials would probably not be subject to RCRA or RCRA export requirements for hazardous wastes. If PCBs and asbestos are expected to be generated from dismantling of ships, both the PCBs and the asbestos would be solid wastes because they are intended to be discarded.

Individual state hazardous waste regulations are required to be equivalent to and no less stringent than the Federal regulations. In many cases, state regulations are more stringent than Federal regulations. If PCBs and asbestos are removed from the structure of a ship, the state regulations presented below are relevant.

Texas has adopted by reference the Federal definition of hazardous waste, and therefore neither PCBs nor asbestos is regulated as hazardous waste. In Texas, however, discarded materials containing asbestos, and light ballasts and small capacitors containing PCBs, are considered special wastes. The state has specific handling and disposal requirements for these wastes disposed of in the United States.

Under Virginia hazardous waste regulations, neither PCBs or asbestos is considered hazardous waste, but under the Virginia solid waste regulations, both PCBs and asbestos are considered special wastes. Like the State of Texas, special handling and disposal requirements are set forth for PCBs and asbestos-containing wastes disposed of in the United States.

In California, both PCBs and asbestos are considered hazardous wastes if their concentration exceeds a specified level. Export requirements for hazardous waste are set forth in the California Hazardous Waste Management Regulations, Title 22, Article 5. Requirements include written notification to the EPA, the California Department of Health Services, and the receiving country. Information to be included in the notification includes a description of the hazardous waste, the estimated frequency of export, the estimated total quantity of the waste, the mode of transport, a description of how the waste will be treated, and the name of any transit countries.

3.2.16 Toxic Substances Control Act (15 USC 2601 et seq.)

The Toxic Substances Control Act of 1976 (TSCA) assigns the Federal government and the EPA the authority to control chemical hazards. The EPA may prohibit or limit the manufacture, importation, processing, distribution, use, labeling, or disposal of chemical substances which are found to present an unreasonable risk to health or the environment.

Under TSCA Section 6(e), PCBs are considered to be an unreasonable risk to health and the environment, and therefore their distribution in commerce is regulated by the EPA (40 CFR 761). With regard to export, PCBs or PCB items with concentrations less than 50 ppm may be exported or distributed in commerce for the purpose of disposal. However, the EPA has maintained a "closed border" policy regarding the export of PCBs with concentrations greater than 50 ppm that are to be disposed of outside the country.

Equipment or structures that contain components with PCB concentrations greater than 50 ppm may be exported from the United States for reuse. However, it is implied that the item sold for reuse will be reused in its entirety and not sold only for reuse of its component parts. With regard to the disposal of MARAD ships, there are several items that may contain PCBs on board vessels, including transformers, light ballasts, capacitors, conduit cabling, felt air handling systems, and adhesives. A vessel containing PCB materials exported for reuse as a vessel may be acceptable

under TSCA export regulations; however, the export of a vessel containing PCB materials for scrap, even if individual items containing PCBs are able to be reused, may not be acceptable under TSCA. There are no regulations promulgated in 40 CFR 761 that specifically deal with this issue.

3.3 FOREIGN LAWS

This section discusses applicable laws of the three countries where former MARAD ships have been scrapped in the last 5 years (Mexico, India, and the People's Republic of China.)

3.3.1 Mexico

Information presented on the laws and regulations of Mexico are taken from an article by Basurto-Gonzalez (23) and a translation of Mexican laws entitled *Mexico: Environmental Laws and Norms*.

3.3.1.1 The General Law of Ecological Equilibrium and Environmental Protection

The General Law of Ecological Equilibrium and Environmental Protection (the General Law), signed in January 1988, codifies Mexico's environmental policy. The six Titles and 194 Articles of the General Law define environmentally related administrative roles and responsibilities, assign jurisdictional authority among Federal, state, and local governments, and establish a framework for promulgating regulations and performance criteria involving Protected Natural Areas (Articles 44-87), Rational Use of Natural Elements (Articles 88-109), Environmental Protection (Articles 110-156), Public Participation (Articles 157-159), and impose Measures for Control and Safety and Sanctions (Articles 160-194). Title IV, Environmental Protection, is composed of seven chapters which provide the framework for prevention and control of pollution of air, soil, water, and aquatic ecosystems; set environmental policies for use and disposal of hazardous materials and wastes; establish the impact of nuclear energy; and control sensory environmental concerns (e.g., noise, heat, and odors).

The processes that control regulatory functions are found in the requirements for permitting and licensing, which are subject to periodic reporting. Should any discrepancies be detected by cognizant agencies, the General Law enables oversight functions to investigate and initiate legally binding corrective actions. Corrective actions may include fines and imprisonment should nonconformances be deemed criminal.

The overall responsibility of administering and enforcing environmental regulations established under the General Law lies with the Secretaria de Desarrollo Urbano y Ecologia (Secretariat of Urban Development and Ecology, or SEDUE). However, other Federal agencies are expected to coordinate activities and share technical expertise with SEDUE where issues within their authority have environmental implications. An example of this cooperative effort is demonstrated by the role of the Secretariat of Communications and Transport in the monitoring and regulating of automobile emissions.

Most laws in Mexico are administered and enforced by administrative agencies; however, environmental legislation is one area where the law expressly delegates authority to state and local governments. The increasing trend is for state and local agencies to supplement Federal laws through formal cooperative agreements with the Federal government.

3.3.1.2 Air Quality Regulations

In November 1988, SEDUE promulgated "Regulations to the General Law of Ecological Equilibrium and Environmental Protection on the Matter of Prevention and Control of Atmospheric Pollution," pursuant to the articles and sections of Title IV of the General Law. This set of regulations (5 Chapters consisting of 52 Articles), in conjunction with 14 Agreements and Normas Tecnicas Ecologicas (Technical Ecological Standards, or NTEs), establish the details and applicability of air quality standards and set the criteria for acceptable air emissions either by industry or by substance.

The area of law under which the ship disposal program might potentially be concerned is "fixed" sources of air pollution. Under these regulations and NTEs, any "fixed" emission source which emits odors, gases, liquid or solid particles must secure, from SEDUE, a license to operate and install pollution-controlling equipment to comply with the air quality standards. To obtain a license, companies must submit a detailed description of their operations and an initial emissions inventory. In addition, these companies must perform air emissions inventories on an annual basis to determine if their emissions comply with the standards and license requirements.

3.3.1.3 Regulations for the Prevention and Control of Water Pollution

Water quality regulations under the General Law have not yet been developed; therefore, 1973 water quality regulations remain in effect. Under the 1973 regulations, any facility or plant discharging wastewater is required to apply for permits from SEDUE, and discharges in excess of the maximum acceptable levels are prohibited.

Under the General Law, NTEs have been established that define the maximum allowable limits for substances permitted in discharges that pertain to specific industry groups. In addition to setting discharge limits, the NTEs define the specific methods for sampling and analysis allowed for use in determining the contaminants of concern. Through 1989, discharge limits have been set for the manufacture or fabrication of: synthetic rubber tires and tubes; asbestos for construction; sheet, pressed, and blown glass; iron and steel; pulp and paper; plastics and synthetic polymers; petroleum and petrochemicals; thermoelectric power; and, textiles. At present, there are no regulations that would affect the operations associated with ship scrapping.

3.3.1.4 Hazardous Substances Regulations

In compliance with the articles and sections of the General Law Title IV, SEDUE in November 1988 promulgated "Regulations to the General Law of Ecological Equilibrium and Environmental Protection on the Matter of Hazardous Wastes." This set of regulations (5 Chapters consisting of 63 Articles), in conjunction with Agreements, Instructions, and NTEs, establish the detailed processes and management requirements for hazardous waste generation, handling, transport, storage, and treatment.

Under the hazardous waste regulations, the SEDUE must be provided with a list identifying both the raw materials used in production processes and the corresponding types of waste generated. This hazardous waste generation statement must also include procedures to handle the hazardous waste generated. Facilities must maintain records of any wastes generated in their operations from collection through storage and disposal, with periodic reports supplied to SEDUE. The Mexican hazardous waste regulations require the use of a manifest for all hazardous waste shipments. In addition, NTEs include a list of specific substances that are defined as hazardous waste when discarded, as well as specific analytical methods for identifying the hazardous waste characteristics of materials not specifically included on the NTE list. The characteristics that define a hazardous waste are similar to those defined by the EPA (Chapter 7, Manual SW-846, Test Methods for Evaluating Solid Wastes) and include corrosivity, flammability, toxicity, reactivity, and explosivity.

The handling of PCBs is subject to the provisions of the Regulations and the NTEs issued for that purpose. The final disposal of PCBs, or waste that contains them, in "controlled confinements" (e.g., landfills or storage buildings) or in any other site is prohibited. PCB-containing wastes may only be destroyed, in accordance with the appropriate NTEs, either by incineration for PCBs at any concentration, or by chemical catalysis for low-level PCB waste.

Chapter IV of the waste regulations is dedicated to the authorizations and restrictions placed on the import or export of hazardous waste, and some of the Articles in this section appear to relate to the ship-scrapping program. SEDUE has the authority to issue permits that allow the import of hazardous waste into Mexico, and the regulations define the procedure for permit application and authorization. Generally, hazardous wastes generated in the production, transformation, and preparation processes from materials imported into Mexico must be exported back to the country of origin. However, authorization for the import of hazardous wastes may be granted when the purpose of importation is for recycling or reuse in Mexican territory. These regulations appear to reflect problems associated with the limited number of disposal facilities in Mexico.

Before any ships containing hazardous wastes are dismantled, a hazardous waste generation statement must be submitted to SEDUE identifying the types of waste expected to be generated including PCBs and asbestos. Due to limitations on final disposal of PCBs and on imported materials that produce hazardous waste, it appears based on Article 55 that any PCBs and/or asbestos that are generated may be required to be transported back to the United States for final treatment and disposal.

The final consideration when discussing hazardous waste laws in Mexico is the subject of liability. Under Mexican law, liability for hazardous waste is limited to damages and cleanup costs, and this liability lies primarily with the generator. However, anyone involved with the waste is potentially liable.

3.3.2 India

This section discusses the applicable laws of India. Information presented below is based on the specific acts cited.

3.3.2.1 Air (Prevention and Control of Pollution) Act

The Air Act is intended to provide for the prevention, control and abatement of air pollution. Under the Air Act, the State Board has established a comprehensive program which sets standards for air quality and emission standards for air pollutants from industrial plants and automobiles for the entire country.

Under the Air Act, the state government, after consultation with the State Board, has the ability to establish any area or areas within the state as air pollution control areas. If an area is designated as a control area, the state government can prohibit the use of nonapproved fuels that may cause air pollution, restrict the use of nonapproved appliances, prohibit the burning of materials that are not fuels and may cause air pollution, and prohibit the operation of an industrial plant without prior approval.

Under the Air Act, any industrial plant or manufacturer must prevent, control, or abate air pollution. If the industrial plant or manufacturer is located in a control area, it must get approval from the state government to operate, and must comply with all additional requirements set forth by the state government. If the ship-scrapping program is in a control area, the burning of any material that is not fuel is not permitted.

3.3.2.2 Water (Prevention and Control of Pollution) Act

The Water Act is intended to prevent and control water pollution and to maintain or restore the wholesomeness of water. Under this act, the State Board has established a comprehensive program which sets forth annual effluent standards for sewage and trade effluents, standards for the quality of receiving water resulting from the discharges of effluents, and standards of treatment of sewage and trade effluents to be discharged into streams. The State Board has also developed methods for the treatment of sewage and trade effluents and methods of utilization of sewage and trade effluents in agriculture.

Under the Water Act, the state government, after consultation with the State Board, has the ability to designate any area or areas within the State as water pollution, prevention, and control areas. If an area is designated as a control area, the provisions of the Water Act apply. Under the Water Act, it is forbidden to cause or permit any poisonous, noxious, or pollution matter, as determined by the State Board, to enter into any stream, well, or sewer, or to impede the proper flow of a stream in a manner that may cause substantial aggravation of pollution due to its consequences. The establishment or operation of an industry or any treatment or disposal system without prior approval from the State Board is also prohibited.

3.3.2.3 Hazardous Waste (Management and Handling) Rules

The Hazardous Waste Rules establish guidelines for the collection, labeling, packaging, transportation, treatment, storage, disposal, importation, and exportation of hazardous wastes. Hazardous wastes are defined as any wastes identified in the Schedule Rules, and they include asbestos, waste oil, and oil emulsions. Any industry which generates hazardous wastes in quantities equal to or greater than the limits identified in the schedule is required to take all practical steps to ensure that they are treated, stored, and disposed of properly.

Under the Hazardous Waste Rules, the importation of hazardous wastes for disposal is prohibited; however, if the waste is to be processed as raw material, it may be imported with prior approval from the State Pollution Control Board. To obtain approval from the State Pollution Control Board, the exporting country or exporter must declare, on a form, the proposed transboundary movement of the hazardous waste, and the importer must fill out and maintain records of the hazardous waste imported.

If hazardous waste is generated during the dismantling of ships (e.g., PCBs, asbestos, and oils), a form must be submitted to the Central Government (the Ministry of Environment and Forests) for approval prior to the delivery of the ships to India. Additionally, any specific waste management conditions set forth by the central government as a condition of approval must be followed. All guidelines for the proper collection, labeling, packaging, transportation, treatment, storage, and disposal of any hazardous wastes generated must be followed as well.

3.3.3 The People's Republic of China

This section discusses the applicable laws of the People's Republic of China. Information presented below is based on the specific acts cited.

3.3.3.1 The Law of the People's Republic of China on the Prevention and Control of Air Pollution

The Law of the People's Republic of China on the Prevention and Control of Air Pollution is intended to prevent and control air pollution and protect and improve the living and ecological environment in order to safeguard human health. Under this law, the State Council, through its environmental protection department, has established national air pollutants emission standards in accordance with the nation's economic and technology conditions. The law also gives the provinces, autonomous regions, and municipalities the ability to establish their own air pollution emission standards for items not addressed in the national standards, or to develop standards that are more stringent than the national standards.

Under the law, any enterprise or institution that emits air pollutants must report and register with the local environmental protection department their existing emitting and treatment facilities for pollutants and the categories, quantities, and concentrations of pollutants emitted under normal operating procedures, as well as relevant information on the prevention and control of their air pollution. Any enterprise or institution exceeding national or local standards must take effective measures to control and eliminate the pollution and pay a fine. If by accident any enterprise or institution emits or leaks toxic, harmful gas, or radioactive substances, thereby causing or threatening to cause air pollution harm to human health, it must take measures to control the hazards, inform inhabitants that are likely to be in danger, and report the occurrence to the local environmental protection department for investigation and disposition.

3.3.3.2 The Law of the People's Republic of China on the Prevention and Control of Water Pollution

The Law of the People's Republic of China on the Prevention and Control of Water Pollution is intended to prevent and control water pollution, protect and improve the environment, safeguard human health, and ensure the effective use of water resources. Under this law, the State Council, through its environmental protection department, has established national water environmental standards and national pollutant discharge standards in accordance with the nation's economic and technology conditions. This law also gives the provinces, autonomous regions, and municipalities the ability to establish their own water quality standards for items not addressed in the national standards, as well as the ability to establish pollutant discharge standards that are more stringent than the national standards.

Any enterprise or institution that discharges pollutants directly into a water body must report and register with the local environmental protection department their existing treatment and discharge facilities and the categories, quantities, as well as concentrations of pollutants discharged under their normal operating conditions, and relevant information on the prevention and control of their water pollution. Enterprises or institutions discharging pollutants into a water body must pay a fee. If their discharge exceeds the national or local standard they must eliminate and control the pollution within a certain period and pay a fine. If by accident any enterprise or institution discharges pollutants in excess of normal quantities, they must take emergency measures to control the hazards, inform inhabitants that are likely to be in danger, and report the occurrence to their local environmental protection department for investigation and disposition. Any ship causing a pollution accident must report the incident to the nearest navigation administration office.

In an effort to protect surface water, this law prohibits the discharge of any oil, acid, or alkaline solutions of deadly toxic liquid wastes, industrial waste residues, urban refuse or other wastes into any body of water, or on beaches, banks, or slopes below the highest water levels. The discharge of residual oil, waste oil, and ship refuse is also prohibited under this law.

3.4 INTERNATIONAL LAWS, TREATIES, AND CONVENTIONS

3.4.1 North American Free Trade Agreement

The North American Free Trade Agreement (NAFTA) establishes free trade between the United States, Canada, and Mexico. Under NAFTA, each country may adopt, maintain, or apply any environmental measure necessary for the protection of human, animal, or plant life, and at a minimum, each country must adopt relevant international standards, and make its environmental measures equivalent to those of the other countries involved in NAFTA. While determining its appropriate level of protection, each country must perform a risk assessment regarding the introduction, establishment or spread of an animal or plant pest or disease while taking into effect relevant economic factors.

Under NAFTA, any trade between the United States, Canada, and Mexico must comply with the environmental regulations established by each country prior to or pursuant to the Agreement.

3.4.2 Convention for the Prevention of Pollution from ships (1973/1978)

Under the Convention for the Prevention of Pollution from Ships (MARPOL) it is the responsibility of every country to take all necessary steps to prevent marine pollution from the discharge of wastes and other matter generated from vessels that is liable to be hazardous to human health, or to harm living resources and marine life. In an attempt to control discharges, each country is required to designate an authority that is responsible for enforcing the requirements of MARPOL, and for establishing facilities for the reception of these materials. The requirements of MARPOL, Annex 1,2,3 and 5 (the Annexes that the United States has agreed to at this time) have been incorporated into U.S. law by the Prevention of Pollution from Ships Act (33 USC 1901 et seq.)(24). Any material covered under the Prevention of Pollution from Ships Act shall be disposed of in accordance with the Act.

3.4.3 United Nations Convention on the Law of the Sea

Under the United Nations Convention on the Law of the Sea, countries have a sovereign right to use their natural resources in a manner that is consistent with their environmental policies and with their responsibility to protect and preserve the marine environment. In order to protect the marine environment, countries must take all necessary measures to prevent, reduce, and control pollution including pollution from toxic, harmful or noxious substance in the marine environment from land-based sources, from vessels, through the atmosphere, or by dumping. This includes all necessary steps to prevent, reduce, and control pollution from vessels and facilities.

4.0 ENVIRONMENTAL SETTING

4.1 INTRODUCTION

This chapter provides relevant environmental baseline information that will be used in Chapter 5.0 to discuss potential impacts from the Maritime Administration's (MARAD's) ship-scrapping program. The program would affect three types of sites: the National Defense Reserve Fleet (NDRF) sites (all within the Continental United States), the overseas routes used to transport the vessels prior to scrapping, and the scrapping sites (all on the shores of foreign countries) (Figure 2-2). The three NDRF sites include the James River Reserve Fleet (JRRF) in Fort Eustis, Virginia; the Beaumont Reserve Fleet (BRF) near Beaumont, Texas; and the Suisun Bay Reserve Fleet (SBRF) near Benicia, California. The three scrapping sites include Tuxpan, Mexico; Alang, India; and numerous sites on the east coast of the People's Republic of China. Environmental setting descriptions are presented that specifically address the Tuxpan and Alang sites, but the description of the Chinese scrapping sites addresses the east coast of the People's Republic of China generally in the vicinity of Beijing, Shanghai, and Guanghzou.

4.2 RESERVE FLEET SITES

The environmental setting is discussed separately for the JRRF, BRF, and SBRF sites. The discussion addresses the air, water, and biological resources surrounding each NDRF site, including inland and nearshore coastal waters that must be crossed to transport vessels from the sites to oceanic waters.

4.2.1 James River Reserve Fleet

The JRRF site is located in southeastern Virginia on the James River, approximately 30 miles upstream from its confluence with the Chesapeake Bay at Norfolk, Virginia, and approximately 45 miles from the Atlantic Ocean. The site is leased from the Fort Eustis Army Transportation Center. The vessels are anchored in a roughly 1-mile segment of the James River facing Fort Eustis. This river segment is partially located in the City of Newport News and partially in Isle of Wight County, Virginia (25,26).

Land-based facilities for the JRRF are accessed through the entrance to Fort Eustis. The JRRF parking lot is connected to a complex of buildings and sheds which serve as the administrative and support services facilities for the fleet. Near the parking lot are several fuel storage tanks, equipment storage sheds and containers, and a hazardous waste storage and shipment area (27).

4.2.1.1 Air Resources

The air quality of the region where the JRRF is located is described in terms of the current attainment status designation for the area and recent ambient air quality monitoring data for the region. The ambient monitoring data are compared to the National Ambient Air Quality Standards (NAAQS). There are six pollutants for which the U.S. Environmental Protection Agency (EPA) has developed NAAQS: particulate matter, sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, and lead. The particulate matter standard was in the past stated in terms of total suspended particulate matter (TSP) but is now measured in terms of particulate matter less than 10 microns in diameter (PM_{10}). Virginia still measures TSP. Not all pollutants are measured at all monitoring locations. For example, there are few lead monitors since the standard for lead is now widely met. Areas are classified in terms of whether or not they meet the NAAQS based on ambient air quality data. Areas that do not meet the NAAQS for a pollutant are designated as nonattainment. Nonattainment areas for ozone, CO, and particulate matter are classified in terms of the severity of the problem. These areas are designated as marginal, moderate, serious, severe, or extreme for ozone, and moderate or serious for CO and particulate matter.

The JRRF is located within the Hampton Roads Interstate Air Quality Control Region (ACQR 223) (40 CFR 81). The area is designated as attainment/unclassified or better than the standards for particulate matter, SO_2, CO, and NO_2. The Newport News/Norfolk area is designated as marginal nonattainment for ozone, and Isle of Wight County is designated as unclassified/attainment for ozone (40 CFR 81.347). Ambient monitoring data for 1993 from monitors in Newport News, Suffolk, Chesapeake, and Norfolk are compared to the NAAQS in Table 4.1.

4.2.1.2 Water Resources

The James River flows in an easterly direction for over 200 miles from its headwaters in the mountains of west-central Virginia to the Chesapeake Bay at Norfolk, Virginia. Where it passes the JRRF, the river is tidal and contains brackish water, one of several tidal tributaries comprising the Chesapeake Bay estuarine system. The Chesapeake Bay is one of the largest estuaries in the United States, with a surface area of 3,830 square miles and a watershed of 69,280 square miles, including parts of Virginia, West Virginia, Maryland, Pennsylvania, New York, and Delaware (29).

Table 4-1. Ambient Air Quality for James River Area

Pollutant	NAAQS	Newport News	Suffolk	Chesapeake	Norfolk
PM_{10} Annual Arithmetic Mean[b]	50 $\mu g/m^3$			22.5 $\mu g/m^3$	22.8 $\mu g/m^3$ [a]
24-hour[b]	150 $\mu g/m^3$			46 $\mu g/m^3$	49 $\mu g/m^3$ [a]
SO_2 Annual Arithmetic Mean	80 $\mu g/m^3$ (0.03 ppm)				0.007 ppm [c]
24-hour[d]	365 $\mu g/m^3$ (0.14 ppm)				
3-hour[d]	1300 $\mu g/m^3$ (0.50 ppm)				
CO 8-hour[d]	10 mg/m^3 (9 ppm)				
1-hour[d]	40 mg/m^3 (35 ppm)	9.7 ppm			11.7 ppm [e] 7.5 ppm [c]
NO_2 Annual Arithmetic Mean	100 $\mu g/m^3$ (0.053 ppm)		0.136 ppm (exceeded 3 days)		0.021 ppm [c]
Ozone 1-hour maximum[f]	235 $\mu g/m^3$ (0.12 ppm)				
Lead Quarterly	1.5 $\mu g/m^3$			0.06 $\mu g/m^3$	0.15 $\mu g/m^3$ [e]

Sources: 28, 40 CFR 50

[a] Norfolk (monitoring station 181-S)
[b] TSP was the indicator for the original particulate matter (PM) standards but it has been replaced with the new PM_{10} standard. New PM standards were promulgated in 1987, using PM_{10} as the new indicator pollutant. The annual standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard level; the 24-hour standard is attained when the expected number of days per calendar year above the standard level is equal to or less than 1.
[c] Norfolk (monitoring station 181-Z)
[d] Not to be exceeded more than once per year.
[e] Norfolk (monitoring station 181-V)
[f] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than 1.

The Chesapeake Bay estuarine system, including the tidal parts of the James River, has been subject to water pollution from a variety of sources. Waters throughout the Chesapeake Bay have been subject to heavy rates of sedimentation and toxic discharges that have led to eutrophication (rapid growth of algal blooms in response to overenrichment with phosphorus and other nutrients) and rapid widespread loss of submerged aquatic vegetation (discussed in Section 4.2.1.3). The James River had been subject to illegal discharges containing kepone, a fish toxin, until the mid-1970s. The harbors at Norfolk have experienced contamination by tributyl tin, a biocide used in hull paints (30).

Potable water is supplied to the JRRF site by the Newport News Waterworks. Wastewater generated at the JRRF site is sent to the wastewater treatment facility at Fort Eustis. A Spill Prevention Control and Countermeasures (SPCC) plan is being implemented by the JRRF to prevent contamination of James River waters from oil spilled or leaked from above-ground storage tanks on the site (27).

4.2.1.3 Biological Resources

Lands comprising the JRRF site are heavily disturbed and subject to frequent human activity, and are thus of limited value to terrestrial wildlife. The JRRF is bordered to the north by federally owned wetlands and other naturally vegetated terrestrial habitats which are managed by Fort Eustis. The JRRF vessels themselves provide habitat for aquatic and terrestrial species, especially birds (27).

The Chesapeake Bay and its tidal tributaries, including the James River, comprise one of the largest and historically most biologically productive estuaries in the United States. Contributing to this productivity were extensive zones of submerged aquatic vegetation within the shallow waters of the bay and zones of tidal marshes and mudflats fringing the bay. Tidal and nontidal wetlands in the Chesapeake Bay watershed have been designated as "Wetlands of International Importance Especially as Waterfowl Habitat" under the 45-nation Ramsar Convention Treaty (32). However, a baywide decline in submerged aquatic vegetation began in the late 1960s, attributable mainly to decreased light absorption, which results from increased sedimentation of water in the bay (32). Tidal marshes surrounding the bay were reduced by about 9 percent between the mid-1950s and the late 1970s (31), but land use regulations implemented by Maryland and Virginia have helped reduce tidal marsh losses caused by urbanization.

The federally endangered bald eagle has been reported to nest at several locations on the James River in the vicinity of the JRRF and on the downstream reaches of the James River and Chesapeake Bay between the JRRF and the Atlantic Ocean. The shoreline of the Chesapeake Bay near Norfolk also provides habitat for the federally threatened piping plover. Several federally listed plants are known to occur along the shoreline of the James River and Chesapeake Bay near Norfolk. The state endangered eiphytic sedge and the state threatened spanish moss have been recorded along the James River in the vicinity of the JRRF, and several other state listed species also occur in the waters and on the shorelines of the James River and Chesapeake Bay (33).

A nest of the federally endangered peregrine falcon was discovered on a vessel in the JRRF in 1987. The peregrine falcons prey on the numerous pigeons which live on JRRF vessels. By 1991, this nest was recognized as the most productive peregrine falcon nest in Virginia (34). The vessel on which the nest is located and those next to it have not been moved in order to protect the nest.

4.2.2 Beaumont Reserve Fleet

The BRF site is located in southeastern Texas, on the Neches River system immediately southeast of the City of Beaumont. BRF vessels are anchored in a basin north of the Neches River shipping channel, approximately 10 miles west of the City of Port Arthur and the Gulf of Mexico (35,36). Portions of the basin are located in Jefferson and Orange counties (37).

Land-based facilities for the BRF are accessed by a private entrance road off County Highway 347, which leads to a restricted area and guarded gate. Immediately outside the fenced area are locations for contractor parking, excess boat and material storage, and a water tower and associated pumphouse which are no longer in use. Within the fenced complex are several small buildings which serve as the administrative and support services facilities for the BRF (35).

4.2.2.1 Air Resources

The air quality of the region in which the BRF is located is described in terms of the current attainment status designation for the area and recent ambient air quality monitoring data for the region. The NAAQS and the attainment status designations are discussed in Section 4.2.1.1.

The BRF is located within the Southern Louisiana/ Southeastern Texas Air Quality Control Region (AQCR 106) (40 CFR 81). The area is designated as attainment/unclassified or better than the standards for total suspended particulates, SO_2, CO, NO_2, and ozone. The area is not classified for PM_{10} and lead (40 CFR 81.344). Ambient monitoring data for SO_2, CO, NO_2, and ozone for 1993 and particulate matter for 1992 from monitors in Beaumont and Port Arthur are compared to the NAAQS in Table 4-2. Port Arthur is located about 15 miles southeast of Beaumont.

4.2.2.2 Water Resources

The Neches River flows in a southeasterly direction for approximately 200 miles, draining an area of approximately 10,000 square miles, before reaching Sabine Lake, an inlet of the Gulf of Mexico (38). Where the river passes the BRF site, it is tidal and contains brackish water. Sabine Lake and the tidal parts of the Neches and Sabine rivers comprise an integrated estuarine system.

Coastal waters along the Gulf of Mexico in both Louisiana and Texas have experienced a number of pollution problems. Finding suitable places to deposit sediment that must be periodically dredged from navigable waters on the Texas coast has been increasingly difficult (30). The estuarine parts of the Neches River have a history of pollution problems associated with sewage discharges, the region's dominant petroleum industry, and salinity increases caused by upstream withdrawals of fresh water. The biochemical oxygen demand of wastes discharged to the estuarine part of the river (BOD loading) in 1968 was high, attributable mostly to shoreline industry (39). Benthic macroinvertebrate populations in these waters in the early 1970s indicated poor water quality based on the absence of several pollution-sensitive species (38).

Implementation of Federal and Texas water pollution control regulations have resulted in a general improvement in the quality of estuarine waters in the Neches River, including a substantial reduction in BOD loading by 1986 and an improvement during the 1980s in benthic macroinvertebrate populations. However, stormwater runoff from urban and industrial areas in the region and from rural areas in the hedwaters are a continuing concern (39).

Potable water is supplied to the BRF site by the municipal water supply servicing the Beaumont, Orange, and Port Arthur areas. Wastewater generated at the BRF site is discharged to an onsite leachfield. An SPCC plan is being implemented by the BRF to prevent contamination of Neches River waters from oil spilled or leaked from above-ground storage tanks on the site (35).

Table 4-2. Ambient Air Quality Beaumont/Port Arthur, Texas

Pollutant	NAAQS	Beaumont	Port Arthur
PM_{10} Annual Arithmetic Mean[a]	50 $\mu g/m^3$	25.5 $\mu g/m^3$	NA
24-hour[a]	150 $\mu g/m^3$	108 $\mu g/m^3$	NA
SO_2 Annual Arithmetic Mean	80 $\mu g/m^3$ (0.03 ppm)	0.007 ppm	0.003 ppm
24-hour[b]	365 $\mu g/m^3$ (0.14 ppm)	0.060 ppm	0.043 ppm
3-hour[b]	1300 $\mu g/m^3$ (0.50 ppm)	0.173 ppm	0.093 ppm
CO 8-hour[b]	10 mg/m^3 (9 ppm)	4.4 ppm	NA
1-hour[b]	40 mg/m^3 (35 ppm)	6.4 ppm	NA
NO_2 Annual Arithmetic Mean	100 $\mu g/m^3$ (0.053 ppm)	0.01 ppm	NA
Ozone 1-hour maximum[c]	235 $\mu g/m^3$ (0.12 ppm)	0.124 ppm	0.115 ppm
Lead Quarterly	1.5 $\mu g/m^3$	NA	NA

Source: 40, 40 CFR 50

[a] TSP was the indicator for the original particulate matter (PM) standards, but it has been replaced with the new PM_{10} standard. New PM standards were promulgated in 1987, using PM_{10} as the new indicator pollutant. The annual standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard level; the 24-hour standard is attained when the expected number of days per calendar year above the standard level is equal to or less than 1.

[b] Not to be exceeded more than once per year.

[c] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than 1.

4.2.2.3 Biological Resources

Lands comprising the BRF site are heavily disturbed and subject to frequent human activity, and are thus of limited value to terrestrial wildlife. Most lands in the immediate vicinity of the site support industrial development and are therefore of limited value as wildlife habitat, although areas of undeveloped wetland (coastal marsh) also occur in the area. The BRF vessels themselves provide habitat for aquatic and terrestrial species, especially birds (35).

Except where it passes through urbanized areas, the Neches River southeast of Beaumont and Sabine Lake is fringed by expansive tidal marshes that are several miles wide at places. The urbanized waterfronts of Beaumont, on the Neches River immediately northwest of the BRF, and Port Arthur, on Sabine Lake, each occupy more than 5 miles of shoreline. Other scattered industrial developments have encroached upon and fragmented the tidal marshes along both the Neches River and Sabine Lake (41).

The extreme fluctuations in salinity and discharge in the Neches River estuary, coupled with water pollution and ongoing dredging activities to maintain navigability, make it a harsh environment for aquatic biota (38). By the 1970s, fishing had declined to near nonexistence. Freshwater sportfish, such as largemouth bass, had been driven upriver from the estuary, and remaining populations of marine sportfish such as drum, redfish, and speckled trout had declined. However, populations of both benthic macroinvertebrates and sportfish had shown indications of recovery in the 1980s (39).

Federally endangered species reported by the Texas Natural Heritage Program in the general vicinity of the BRF Site and the Gulf of Mexico include the leatherback sea turtle, Kemp's Ridley sea turtle, Atlantic hawksbill sea turtle, peregrine falcon (migrant only), bald eagle, and brown pelican. Federally threatened species reported to occur in the same area include the loggerhead sea turtle, piping plover, and green sea turtle (42). Most of these species would be expected only in undeveloped coastal habitats in the region. Several Federal candidate species, threatened and endangered species listed by the State of Texas, special natural communities, and bird rookeries also occur in this area. Two wildlife management areas, Sydnes Island and the Lower Neches Wildlife Management Area, are located on the Neches River and Sabine Lake in the vicinity of the BRF (42).

4.2.3 Suisun Bay Reserve Fleet

The SBRF site is located in west-central California on Suisun Bay, northeast of San Francisco Bay and immediately northeast of the City of Benicia. SBRF vessels are anchored in southwest Suisun Bay north of Army Point and the Carquinez Strait (43, 44). Although the entire fleet is presently anchored close to the north shore of Suisun Bay, in Solano County, portions of Suisun Bay south of the fleet are in Contra Costa County (45). Suisun Bay is located approximately 35 miles from the Pacific Ocean, by way of San Pablo Bay and San Francisco Bay.

Land-based facilities for the SBRF are accessed from a continuation of Lake Herman Road leading to a restricted gate. Inside the gate is a parking lot area that also includes fuel storage tanks, equipment storage sheds and containers, and a hazardous waste storage and shipment area. The parking lot is connected by a causeway to a complex of five barges which serve as the administrative and support service facilities for the SBRF. The barge complex contains the office space, warehousing facilities, and maintenance shops necessary for routine operation of the reserve fleet (43).

4.2.3.1 Air Resources

The air quality of the region where the SBRF is located is described in terms of the current attainment status designation for the area and recent ambient air quality monitoring data for the region. The NAAQS and attainment status designations are discussed in Section 4.2.1.1.

The SBRF is located within the San Francisco Bay Area Air Quality Control Region (AQCR 30) (40 CFR 81). The area is designated as attainment/unclassified or better than the standards for total suspended particulates, SO_2, and NO_2. The urban portion of Solano County within AQCR 30 is designated as moderate nonattainment for CO and ozone. The area is not classified for PM_{10} (40 CFR 81.305). Ambient monitoring data for SO_2, NO_2, CO, ozone, and PM_{10} for 1992 from monitors in Vallejo and Concord (the nearest monitors to SBRF) are compared to the NAAQS in Table 4-3. These monitors are approximately 5 miles from the fleet anchorage.

4.2.3.2 Water Resources

Suisun Bay is an estuarine body of brackish water that receives freshwater discharges from the Sacramento and San Joaquin Rivers to the east, Montezuma Slough, Suisun Slough, and Goodyear Slough to the north, Sulfur Springs Creek and Pacheco Creek to the east, and Carquinez Strait to the west

Table 4-3 Ambient Air Quality for Vallejo and Concord, California

Pollutant	NAAQS	Vallejo	Concord
PM_{10} Annual Arithmetic Mean[a]	50 $\mu g/m^3$	NA	22.6 $\mu g/m^3$
24-hour[a]	150 $\mu g/m^3$	NA	NA
SO_2 Annual Arithmetic Mean	80 $\mu g/m^3$ (0.03 ppm)	NA	NA
24-hour[b]	365 $\mu g/m^3$ (0.14 ppm)	8 $\mu g/m^3$	8 $\mu g/m^3$
3-hour[b]	1300 $\mu g/m^3$ (0.50 ppm)	NA	NA
CO 8-hour[b]	10 mg/m^3 (9 ppm)	6.4 mg/m^3	5.3 mg/m^3
1-hour[b]	40 mg/m^3 (35 ppm)	NA	NA
NO_2 Annual Arithmetic Mean	100 $\mu g/m^3$ (0.053 ppm)	NA	NA
Ozone 1-hour maximum[c]	235 $\mu g/m^3$ (0.12 ppm)	10 $\mu g/m^3$	11 $\mu g/m^3$
Lead Quarterly	1.5 $\mu g/m^3$	NA	NA

Source: 47, 40 CFR 60

[a] TSP was the indicator for the original particulate matter (PM) standards, but it has been replaced with the new PM_{10} standard. New PM standards were promulgated in 1987, using PM_{10} as the new indicator pollutant. The annual standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard level; the 24-hour standard is attained when the expected number of days per calendar year above the standard level is equal to or less than 1.
[b] Not to be exceeded more than once per year.
[c] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than 1.

(46). Suisun Bay is connected by the roughly 8-mile Carquinez Strait to San Pablo Bay, which is the northern extension of San Francisco Bay.

Water quality in all parts of the San Francisco Bay estuarine complex, which includes Suisun Bay, has experienced a long history of sedimentation attributable to agricultural and mineral development in the watersheds of the Sacramento and San Joaquin Rivers. Freshwater flow into San Francisco Bay had been reduced by 60 percent (from original volume) as of 1989, and is projected to be reduced to 70 percent by the year 2000. This has significantly increased the salinity of the bay, to the detriment of biota requiring brackish water (30). Because of rapid sedimentation, periodic maintenance dredging has been necessary to maintain navigability in the vicinity of the SBRF. The navigable open waters of Suisun Bay are ringed by tidal and nontidal marshes and mudflats (46).

The SBRF site is not connected to public sewer lines and does not employ an onsite septic system or wastewater treatment facility. Sanitary wastewater generated at the SBRF site is sent to a barge tank and is removed regularly by a commercial vendor. In the past, bilge water was customarily collected in a barge tank and shipped offsite for treatment in an oil-water separator. The SBRF site has changed to the use of an on-site oil-water separator. Water from this operation is sent to the local publicly owned treatment works and the oil is sent offsite for recycling or disposal as a hazardous waste (43).

The SBRF site uses land-based gasoline and solvent storage tanks and ship-based diesel storage tanks on the barges that house its administrative offices. An SPCC plan is being implemented to minimize the potential for contamination of Suisun Bay waters from spills or leaks of these materials. There are currently no active or inactive underground storage tanks for petroleum or hazardous substances at the SBRF site (43).

4.2.3.3 Biological Resources

Lands comprising the SBRF site are heavily disturbed and subject to frequent human activity, and are thus of limited value to terrestrial wildlife. The SBRF is bordered by tidal marsh (coastal brackish marsh), diked salt marsh (northern coastal salt marsh), and the open waters of Suisun Bay. Suisun Marsh, to the north and east, is the largest remaining wetland in the San Francisco Bay area. Managed for recreational hunting and wildlife, Suisun Marsh provides valuable habitat for waterfowl migrating along the Pacific Flyway (43,46). The SBRF vessels themselves provide habitat for aquatic and terrestrial species, especially birds (43).

Wetland-dependent wildlife in the vicinity of Suisun Bay and other waters in the San Francisco Bay has been adversely affected by habitat loss, especially the filling of wetlands and habitat fragmentation. The introduction of exotic species has also adversely impacted wildlife (46). Of the 8500 square miles of tidal marshes once associated with San Francisco Bay area, only 50 square miles remained as of 1989 (30).

Federally listed threatened or endangered wildlife species which could occur in the vicinity of SBRF include the California clapper rail, California brown pelican, peregrine falcon, California least tern, Aleutian Canada goose, western snowy plover, and salt marsh harvest mouse (46). Of these, the salt marsh harvest mouse has been specifically recorded in the marshes on the south shore of Suisun Bay, directly south of the SBRF (48). Most of these species would be expected only in undeveloped coastal habitats in the region. Federally listed threatened or endangered fish species which could occur in the vicinity of SBRF include the winter run chinook salmon, delta smelt, and Sacramento splittail (proposed for listing). No federally listed threatened or endangered plants occur in the vicinity of the SBRF site (46).

4.3 OVERSEAS TRANSPORT ROUTES

Each of the NDRF sites and each of the scrapping sites are located close to the ocean or to oceanic seas, such as the Gulf of Mexico, Arabian Sea, East and South China Seas, and Yellow Sea. Thus, the following general description focuses primarily on the environmental setting of the open ocean. The open ocean is discussed in the context of its closely affiliated coastal waters. Coastal waters traversed to reach the NDRF sites or the scrapping sites are discussed in Sections 4.2 and 4.4, respectively.

4.3.1 Air Resources

The air quality over the ocean is not readily quantified and is not generally a concern.

4.3.2 Water Resources

Unpolluted seawater, unlike the freshwater in most rivers, streams, and lakes, is characterized by high concentrations of sodium chloride, magnesium chloride, magnesium sulfate, calcium sulfate, potassium sulfate, calcium carbonate, magnesium bromide, bromine, and lower concentrations of several other solutes. Salinities in the open ocean are typically between 34 and 36 parts per thousand (49), but can be lower in coastal areas near the mouths of freshwater rivers and higher in semienclosed waterbodies with little freshwater inflow, such as the Mediterranean Sea.

Although oceans have historically been considered to be relatively free of pollution, observations within the last 20 years have demonstrated increased pollution of coastal waters. Marine pollution has been especially serious in estuaries, such as the Chesapeake Bay (discussed in Section 4.2.1.2), and in enclosed seas such as the Mediterranean Sea. For example, areas of the Mediterranean Sea have been recently subject to massive algal blooms, and unsafe levels of human pathogens have been recorded in waters near several Mediterranean beaches. Increased algal blooms have also been observed in several coastal oceanic waters, including the Gulf of Mexico, the Atlantic Ocean off the North Carolina coast, and the East China Sea (50). Pollution of the surface waters of the ocean, especially waters near the coast which provide habitat for a rich diversity of aquatic biota, has been compared to destruction of critical habitat for terrestrial biota (51).

4.3.3 Biological Resources

A diversity of marine biota is adapted to all parts of the ocean and seas. Biological productivity in the oceans is generally highest in coastal areas and lowest in open waters. The most biologically productive ocean waters are coastal upwellings, where currents cycle nutrients from sediments to the surface. The principal coastal upwellings occur on the west coast of South America near the equator, the coast of California, the east coast of Africa, and the west coast of Africa (52).

The most productive and diverse marine ecosystems are coral reefs, which have been compared to tropical rainforests in terms of species richness (53). Coral reefs occur in waters traversed by the subject routes, including concentrations of reefs in waters off Southeast Asia and most Pacific Islands, in the Gulf of Mexico and Caribbean Sea, off the east coast of Africa, off Madagascar, and off the southern tip of India. Coral reefs provide critical habitat for numerous marine species, protect coastlines against wave-induced erosion, and are of recreational value to tourists (52, 53). Coral reefs have been increasingly subject to damage from water pollution, sedimentation, coral disease, and physical disturbance by coral miners and boaters (50,53).

4.4 SCRAPPING SITES

The environmental setting is discussed separately for the scrapping sites in Tuxpan, Mexico; Alang, India; and the east coast of the People's Republic of China. The discussion addresses air, water, and biological resources surrounding each of the scrapping sites and coastal waters crossed by the transport routes between the oceans (or Gulf of Mexico) and the scrapping sites.

4.4.1 Tuxpan, Mexico

The Mexican scrapping site is located in the northern part of the State of Veracruz on the Tuxpan River approximately 10 miles from the Gulf of Mexico and 5 miles from the city of Tuxpan (Figure 4-1). The scrapping site comprises a roughly 4-acre work area adjoining a 500-foot-long, man-made canal (20). The surrounding landscape primarily comprises rolling plains that separate the coast of the Gulf of Mexico from the mountains of the Sierra Madre Oriental (56). Lands in the general vicinity of the site are generally rural, comprising natural grasslands, small farms, and scattered small industries (20).

The City of Tuxpan, with a population of 75,000, is a fishing town and minor oil port that also accommodates small numbers of tourists (mostly Mexican) using the Gulf beaches to the east (56). The city is characterized by winding streets lined with two-story buildings and a waterfront walkway on the Tuxpan River that is lined with diners, hotels, and shops. Small ferryboats transport people from the waterfront across the river (57). Although the city does not have the appearance of an oil town, a large complex of land-based facilities has been constructed by the Mexican national petroleum company, Pemex, to the east of the city (58), in the same direction as the scrapping site.

4.4.1.1 Air Resources

The air quality of the region where the former reserve fleet ships are scrapped is described in terms of recent ambient air quality monitoring data where such data are readily available. The ambient monitoring data are compared to the World Health Organization (WHO) Guidelines. The WHO recommends that SO_2 exposure not exceed an annual mean of 40 to 60 $\mu g/m^3$, that suspended particulate matter (SPM) exposure not exceed an annual mean of 60 to 90 $\mu g/m^3$ (using high-volume gravimetric sampling) or 40 to 60 $\mu g/m^3$ (using the smoke shade method), that NO_2 exposure not exceed a 24-hour average of 150 $\mu g/m^3$, that CO exposure not exceed an 8-hour average of 10 mg/m^3, and that lead exposure not exceed an annual mean of 0.5 to 1 $\mu g/m^3$ (59). Limited data are obtained for monitoring locations in major cities based primarily on data from the Global Environmental Monitoring System (GEMS) (60, 61). These data are limited to three pollutants: particulate matter, SO_2, and NO_2.

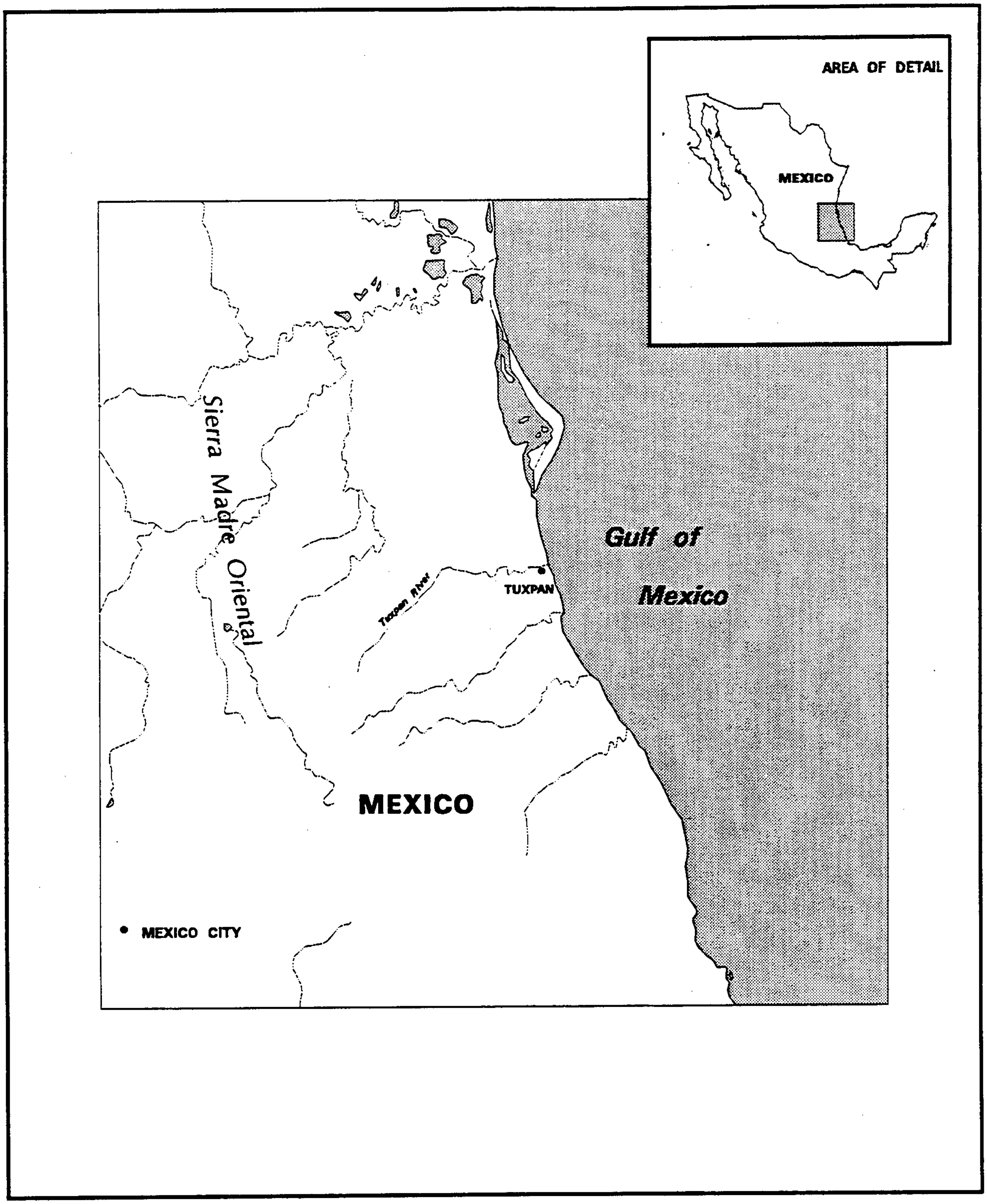


Figure 4-1. Tuxpan, Mexico, and Vicinity.

Approximate Graphic Scale:
1 in = 50 mi

Sources: 54, 55.

No ambient air quality data are available for the area near Tuxpan. It is expected that the coastal region not near industrialized areas and ship-scrapping sites may meet the WHO guidelines for SO_2. It is expected that concentrations of SO_2, NO_2, CO, and SPM may be high in the area near the ongoing ship-scrapping operations due to fuel-burning equipment, soil disturbance, the Pemex facility, and other nearby industries.

4.4.1.2 Water Resources

The Tuxpan River originates roughly 100 miles northeast of Mexico City in the dry, high plateau of the Sierra Madre Oriental and traverses approximately 75 miles of gorges and lowlands to the Gulf of Mexico (Figure 4-1). By the time it reaches the City of Tuxpan and the scrapping site, it is a tidal, estuarine river with brackish water.

Although the river crosses the large Chicontepec oil field about 30 miles west of the City of Tuxpan (62), available evidence suggests that the river does not suffer from severe water pollution. The river is described as aesthetically attractive at the City of Tuxpan and is clean enough that local children swim in it (57). A visitor to the scrapping site observed several fishermen using the river (20).

Available evidence likewise suggests that Gulf of Mexico waters along sand beaches near the confluence of the Tuxpan River do not suffer from severe water pollution. Although a power station has been recently constructed on the Gulf of Mexico less than 2 miles north of the Tuxpan River, it has not noticeably affected the cleanliness of the Gulf water (56). This and other industrial facilities recently constructed in the vicinity of the beaches have not eliminated their recreational value (58).

Water within the side canal at the Tuxpan site has undoubtedly experienced localized contamination from previous vessel-scrapping operations. The contamination would result from falling solid debris and leaks of oils and fuels from vessel-breaking operations. Although the location of scrapping operations on the side canal has probably served to isolate potential water contamination, some contaminated water could reach the channel as a result of tidal flushing.

4.4.1.3 Biological Resources

Lands near the coast in the northern part of the Mexican State of Veracruz have been mapped under various classification systems as tropical humid forest, savannah, and tropical savannah (53). Although tropical rainforest

occurs to the south of Tuxpan, Tuxpan itself lies well to the north of Mexico's extensive tropical rainforest (63). Based on the maps and first-hand observations by a visitor to the scrapping site, vegetation in the vicinity of Tuxpan appears to be best characterized as a patchwork of grassland and tropical forest vegetation (20). Trees are likely to be widely scattered in the uplands, and forests are most likely to occur in mesic areas bordering rivers and streams.

The shorelines of many tropical estuaries, such as the Tuxpan River, support mangrove forests (64). Mangrove forests form very dense stands that are tolerant of inundation by saline or brackish water. They provide valuable fisheries habitat, stabilize shorelines against ocean currents and storms, and accelerate the accretion of new land (53, 65).

The Gulf waters to the south of Tuxpan support a large fringing reef, a coral reef growing close to the shore (53). Coral reefs are biologically diverse ecosystems found only in tropical marine waters and are highly vulnerable to water pollution (see Section 4.3.2).

Land within the scrapping site itself have been disturbed by dismantling operations (20) and likely support only sparse vegetation. The man-made canal where vessels are berthed for the purposes of scrapping is not likely to be lined with mangrove forest. The small size of the scrapping site (less than 4 acres) probably serves to limit its impact on surrounding habitats, although the value of adjoining lands as wildlife habitat is likely reduced by noise from the ongoing scrapping operation.

4.4.2 Alang, India

The Alang scrapping site is located on the western shore of the Gulf of Cambay, an indentation of the Arabian Sea in the central part of the State of Gujarat (Figure 4-2). Alang is part of the flat, largely barren, plain of the Kathiawar peninsula, also referred to as the Saurashtra (66). Vessels are scrapped on a roughly 4-mile stretch of sand beach on the Gulf of Cambay paralleled by a service road. The beach is divided into 80 parallel lots, each between 200 and 300 feet in width. Each accommodates one vessel for scrapping. The vessels are run aground on the beach during high tides; there are no docking facilities and no side canals or other berthing areas. The service road is lined with huts that provide temporary housing for workers at the scrapping operation (67).

4.4.2.1 Air Resources

The air quality of the region where the former reserve fleet ships are scrapped is described in terms of recent ambient air quality monitoring data where such data are readily available. The ambient monitoring data are compared to the WHO Guidelines described in Section 4.3.1.1. Limited data were obtained for monitoring locations in major cities based primarily on data from GEMS (60, 61). These data are limited to three pollutants: particulate matter, SO_2, and NO_2.

Ambient air quality monitoring data are not readily available for Alang. The nearest ambient monitoring stations are probably in Bombay (about 200 miles south southeast of Alang) and Ahmadabad (about 120 miles north of Alang). Data for Ahmadabad are not readily available. Although the monitoring data for industrialized cities such as Delhi and Bombay indicate that the WHO guidelines for SO_2 and suspended particulate matter are exceeded, more residential or suburban locations seem to meet the guideline for SO_2. Since the prevalence of fuel-burning sources near Alang is not known, it is difficult to assess whether the region meets the WHO guidelines for SO_2 and SPM. It is expected that there may be high concentrations of SPM in this region as a result of windblown dust, as at monitoring locations in Bombay and Delhi. It is expected that concentrations of SO_2, NO_2, CO, and SPM may be high in the area near the ongoing ship-scrapping operations due to fuel-burning equipment and soil disturbances.

4.4.2.2 Water Resources

Alang lies directly on the west shore of the Gulf of Cambay, midway between the Arabian Sea and the inlandmost tip of the Gulf (Figure 4-2). The Gulf of Cambay is characterized by an irregular coastline comprising wide tidal flats dotted with bars and islands (68). Several large rivers, including the Sabarmati, Mahi, Narmada, Tapi, and Shetrunji rivers, drain freshwater into the Gulf, giving it an estuarine character. Shallow waters extend for several miles offshore from the Alang beach (69), and the tidal swing has been described as very wide (67).

No information is available that specifically details water quality in the Gulf of Cambay near the Alang site. However, it is likely that the methods used to break a high volume of vessels at the site have caused contamination of waters near the beach. Because of the shallow depths offshore from the beach, the plume of contamination probably mixes slowly and extends for a considerable distance offshore.

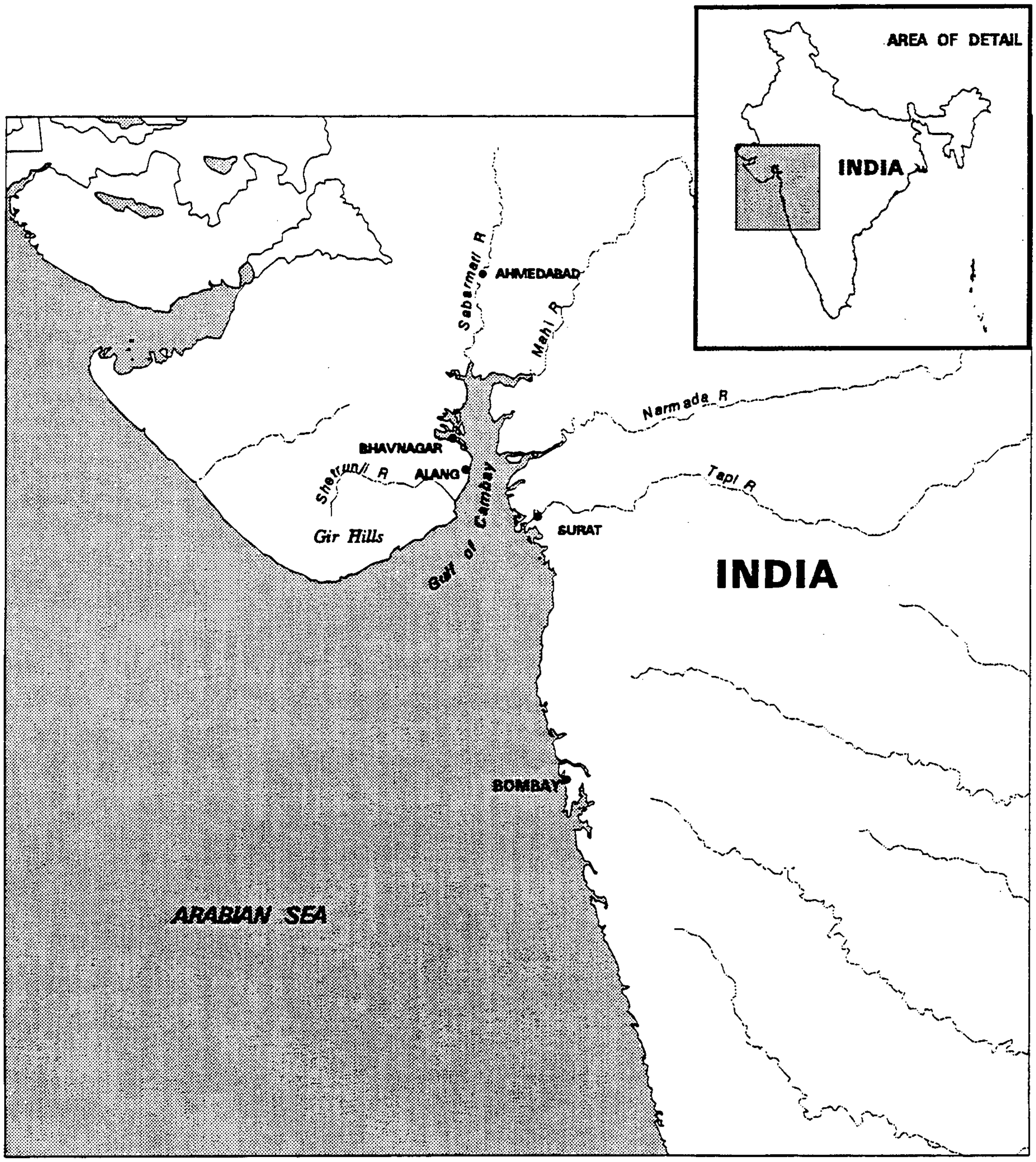


Figure 4-2. Alang, India, and Vicinity.

Approximate Graphic Scale:
1 in = 100 mi

Sources: 54, 55.

Water quality near the beach is probably also affected by the large labor force living at the site. Although a recent visitor to the Alang site did not specifically observe sewage from the workers' huts being disposed of directly in the Gulf of Cambay (67), it is possible that at least some sewage is discharged there. A ship-scrapping operation on a 6-mile beach in Gudani, Pakistan, which uses similar scrapping processes to those at Alang, is described as having open sewers that receive domestic waste from clusters of tarpaper worker shacks on the beach (70).

4.4.2.3 Biological Resources

Lands near the west coast of the Gulf of Cambay have been mapped as warm desert/semidesert, savannah, and warm grass/shrub land (53). No tropical rainforest is mapped in the vicinity of the Gulf of Cambay (63). Land in the immediate vicinity of the scrapping site is rural and treeless, comprised mostly of farmland, especially rice paddies (67, 68). Natural vegetation is thus likely to be limited mainly to coastal marshes. The closest large area of mapped forest cover to Alang is the Gir Preserve, which is about 75 miles southwest of Alang. The preserve was established to protect the last habitat for the endangered Asiatic tiger (71).

Maps indicate that large areas of coastal marshes and other wetlands surround the Gulf of Cambay. These wetlands are considered among the most seriously threatened wetlands in Asia (53). Large areas of mangrove forest have been mapped on the Gulf of Cambay coast near Bhavagnar, to the north of Alang (69). Although mangrove forests are not similarly mapped on the coast near Alang, small areas may occur. Mangrove forests on the coasts of the Indian subcontinent have generally experienced heavy disturbance, and only small patches now remain (65). Although large areas of coral reef are not mapped in the Gulf of Cambay, reefs are mapped in several other gulfs on the Arabian Sea (53), and thus small reefs could be encountered.

The beach at the scrapping site has been disturbed by past breaking operations and supports little or no vegetation (67). Some sparse beachgrasses or other vegetation could be present in places. The noise and intensive human activity associated with ongoing scrapping operations likely limit the value of the scrapping site as wildlife habitat.

4.4.3 East Coast of the People's Republic of China

Scrapping sites are located at numerous scattered locations on the east coast of the People's Republic of China from south of Hong Kong to north as far as the Korean peninsula, with a concentration on the shores of the Yangtze River near

its mouth to the East China Sea (67). The irregularly shaped coastline faces on the South China Sea in the south, near Guangzhou, the East China Sea near Shanghai, and the Yellow Sea (Gulf of Chihli) in the north, near Beijing (Figure 4-3).

4.4.3.1 Air Resources

The air quality of the region where former reserve fleet ships are scrapped is described in terms of recent ambient air quality monitoring data where such data are readily available. The ambient monitoring data are compared to the

WHO Guidelines described in Section 4.4.1.1. Limited data were obtained for monitoring locations in major cities basedprimarily on data from GEMS (60, 61, 72, 73). These data are limited to three pollutants: particulate matter, SO_2, and NO_2.

The ship-scrapping sites in the People's Republic of China are located along the east coast. Without specific locations, it is not possible to determine if ambient air quality data are available near the sites. Some ambient air quality monitoring data are available for Shanghai and Guangzhou. Although the monitoring data for industrialized cities such as Shanghai and Guangzhou indicate that WHO guidelines for SO_2 and SPM are exceeded, more residential or suburban locations seem to meet the guidelines. For 1988 and 1989 the reported average mean annual concentration for a suburban residential area in Guangzhou was 20.5 $\mu g/m^3$ (73). It is expected that the coastal region not near the industrialized areas and ship-scrapping sites may meet the WHO guidelines for SO_2 except where there is a concentration of fuel-burning sources. The prevalence of coal-burning furnaces and domestic stoves in the People's Republic of China is a major contributor to high concentrations of SPM (74). It is expected that concentrations of SO_2, NO_2, CO, and SPM may be high in the area near the ongoing ship-scrapping operations due to fuel-burning equipment and soil disturbance.

4.4.3.2 Water Resources

The South China Sea and East China Sea oceanic components of the Pacific Ocean are defined to the west by the Asian mainland and to the east by a chain of widely scattered islands stretching from the Philippines in the south to Kyushu (the southernmost of the principal Japanese islands) in the north. The Yellow Sea is enclosed to the west and north by the Chinese mainland and to the east by the Korean peninsula. The Yangtze River is one of the three longest

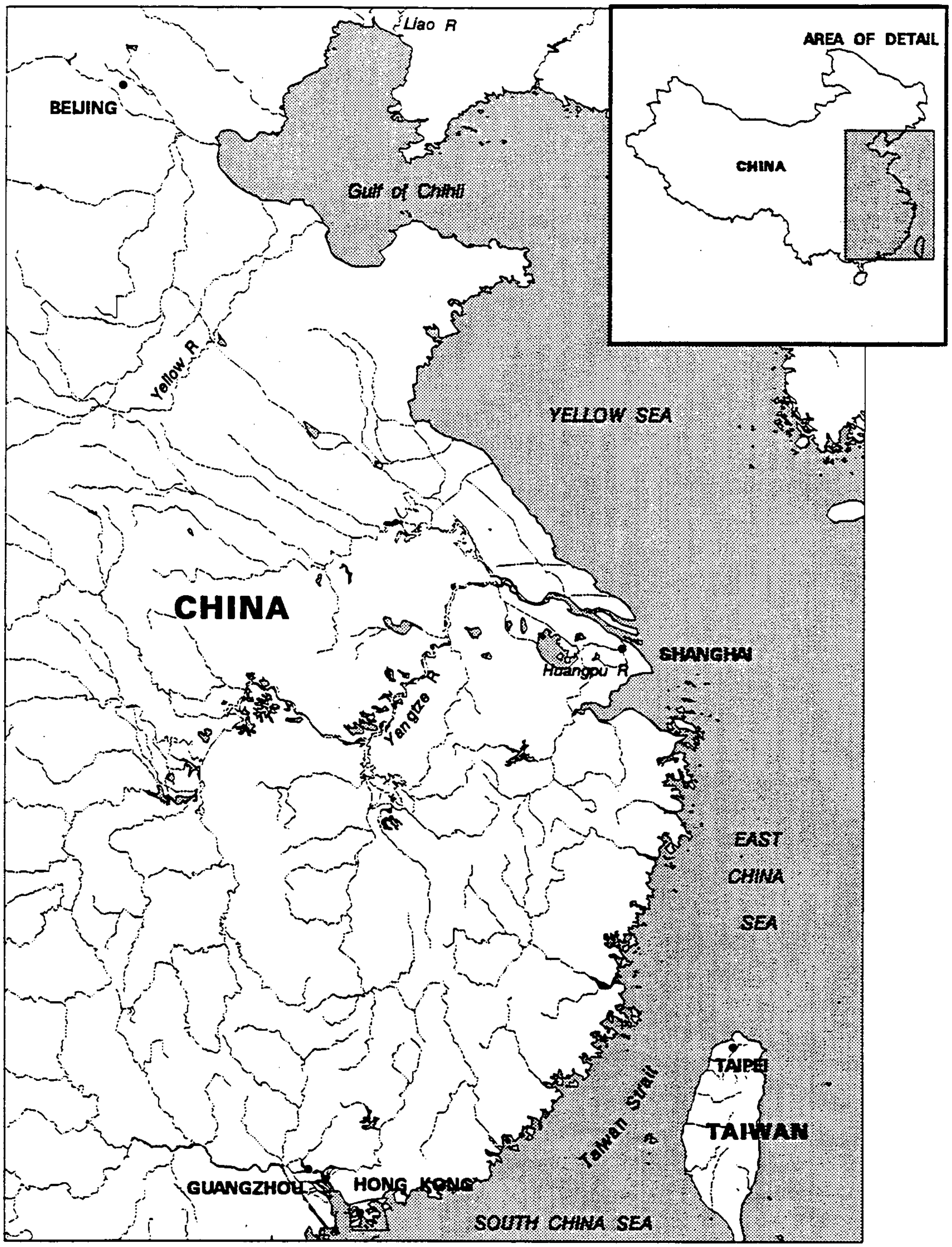


Figure 4-3. East Coast, People's Republic of China.

Approximate Graphic Scale:
1 in = 200 mi

Sources: 54, 55.

rivers in the world, extending for approximately 3,900 miles from western China to the East China Sea near Shanghai (75)(Figure 4-3). The lower reaches of the river where the scrapping sites are located is a large estuary with an exceptionally complex hydrographic and sedimentologic character. This estuary is characterized by a large tidal range of 13 feet and an average depth of 30 feet (76, 77).

Although freshwater flow within the Yangtze River is largely unregulated, a major flood control dam project, the Three Gorges Dam, is proposed, as is a water conveyance canal that would transport substantial quantities of freshwater from the Yangtze River north to the Yellow River, which traverses a more arid part of the country. This diversion would reduce the freshwater inflow to the estuary, increasing its salinity. The City of Shanghai is particularly concerned about the diminished freshwater inflow to the lower parts of the river, which contribute to the municipal water supply (78).

Although the water quality of most Chinese coastal waters was reported as good in 1992, water pollution was reported as serious in some coastal estuaries and bays, including the Yangtze River estuary. Concentrations of inorganic nitrogen and inorganic phosphorus in the estuary exceeded applicable standards by 100 percent and 82 percent, respectively (72). The Huangpu River, which leads from Shanghai's port to the Yangtze estuary, is described in a recent article as "fetid" (79). From a relatively unpolluted status in 1958, the Huangpu River has become steadily more polluted, and in the early 1980s emitted objectionable odors for an average of 100 days per year. Salinity increases seasonally from December through May. This increased salinity limits the ability of water from the Huangpu River to meet the municipal requirements of Shanghai (80).

4.4.3.2 Biological Resources

Natural vegetation on the east coast of China ranges from tropical forest vegetation types in the south to temperate forest and grassland vegetation types in the north (53). Large areas of tropical rainforest once occurred on the southern part of the coast, but little now remains due to human disturbance (63).

The largest areas of coastal wetlands and mudflats on the east coast of China occur in or near the estuaries of the Yangtze and Yellow rivers. Significant wetlands are also associated with the estuarine system of the Liao River at the northern end of the Gulf of Chihli, and Deep Bay and the Pearl River delta near Hong Kong. Most rivers flowing into the East China Sea carry large sediment loads, resulting in a rapid rate of creation of new coastal wetlands and mudflats in their deltas. Mangrove swamps occur on the east coast of China only as far north as central Fujian Province; coastal wetlands to the north are generally marshes (65).

China is home to over 100 rare plant and animal species, many of which are associated with the coast. The Chinese government is making increased efforts to protect endangered wildlife. For example, the Yangtze Crocodile Propagation Research Center has propagated large numbers of the rare Yangtze crocodile for release to the Yangtze River (81).

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 INTRODUCTION

This section addresses the potential environmental consequences of the Maritime Administration's (MARAD's) ship-scrapping program. Environmental consequences are discussed for the National Defense Reserve Fleet (NDRF) sites, the overseas transport routes, and the scrapping sites. Environmental consequences are assessed with greater specificity for the scrapping sites in Tuxpan, Mexico, and Alang, India, than for those in the People's Republic of China. Because numerous unspecified scrapping sites on the east coast of the People's Republic of China must be considered, the assessment is more general.

5.2 NATIONAL DEFENSE RESERVE FLEET SITES

Environmental consequences are discussed generally for the James River Reserve Fleet (JRRF) site, the Beaumont Reserve Fleet (BRF) site, and the Suisun Bay Reserve Fleet (SBRF) site. The assessments consider environmental impacts to air, water, and biological resources surrounding the sites, including inland and nearshore coastal waters that must be crossed to transport vessels from the sites to oceanic waters. Environmental impacts at the NDRF sites would generally be limited.

5.2.1 Air Resources

Air-quality impacts on areas near the reserve fleets related to ship-scrapping procedures are due solely to the normal operation of oceangoing tugs. Tugs move the ships from the berthing area to a nearby pier for preparation for towing and then take them to sea. Emissions from tugs are a very small fraction of the total emissions from shipping operations in the area of each of the reserve fleets and are expected to have very little impact on overall air quality.

5.2.2 Water Resources

No water or other liquids would be discharged from vessels prior to their removal from the reserve fleet sites. Once the vessels are sold, they are towed to a pier for preparation, where any accumulated water is pumped out using an electric air compressor. Based on visual inspection, nonoily water is discharged to surrounding waters at the pier. Small quantities of oil or other dissolved substances could be introduced into the water at the pier. Although this water would not be pretreated, it would not likely result in substantially increased contamination of water at the pier. Oily water is pumped into containers on the ship which are left on board (17).

Vessels in the reserve fleets are presently exposed to rainwater, generating stormwater runoff which could carry dilute concentrations of contaminants from the vessels to surface waters. This stormwater runoff could carry pathogens and plant nutrients from the accumulated bird droppings on the vessels. As the vessels are moved, they could introduce stormwater runoff to other locations. However, because the vessels would never be in the same place for an extended time, the magnitude of potential contamination is minimal.

Tugboats typically move vessels at speeds no greater than 6 knots (17). These speeds would not create wakes capable of inducing water sedimentation through bankside erosion. Tugboats would follow only established navigation channels and would not disturb and resuspend bottom sediments. No dredging would be necessary to specifically accommodate moving the vessels.

Sanitary wastewater would be discharged from tugboats only in compliance with national and international requirements. No solid waste or debris would be allowed to fall into inland waters or the ocean.

5.2.3 Biological Resources

Aquatic biota would be subject to the minimal impacts to water quality discussed in Section 5.2.2. Terrestrial biota would not generally be affected at all. Because the vessels would be moved only through established navigation channels, benthic biota would not be subject to the physical disturbances or increases in turbidity caused by shoaling or dredging. Tugboats would typically move vessels at speeds no greater than 6 knots (17), thus avoiding wakes capable of eroding shoreline vegetation and wetlands.

Terrestrial and aquatic biota using vessels sold for scrapping would be subject to direct disturbance when the vessels were moved. Thus, for example, habitat for birds residing on reserve fleet vessels would be reduced upon their removal for scrapping. The mast of one vessel anchored at the JRRF site is known to provide nesting habitat for the federally endangered peregrine falcon (34). Removal of this ship would result in the loss of the nest. Furthermore, moving adjacent vessels could adversely impact the nesting falcons. In order to protect the peregrine falcon nest, MARAD has not sold or moved the ship containing the nest or those ships adjacent to it. In accordance with Section 7 of the Federal Endangered Species Act, the U.S. Fish and Wildlife Service would be consulted before any of the vessels were moved. Threatened or endangered species are not known to reside on any reserve fleet vessels at either the BRF or SBRF.

5.3 OVERSEAS TRANSPORT ROUTES

Each of the NDRF sites and each of the scrapping sites are located close to the ocean or to oceanic seas, such as the Gulf of Mexico, Arabian Sea, East and South China Seas, and Yellow Sea. Thus, the following assessment focuses primarily on environmental consequences to the open ocean. Environmental consequences to coastal waters traversed to reach the NDRF sites or the scrapping sites are discussed specifically in Sections 5.2 and 5.4, respectively.

5.3.1 Air Resources

Air quality impacts to the ocean environment related to the transport of vessels sold for scrapping are due to operation of oceangoing tugs. Tugs move the ships from the preparation pier inspection area to the foreign site where they are to be disassembled. Based on emission factors for commercial coastal vessels compiled by EPA (83), emissions for the maximum and minimum trip lengths were estimated. The maximum length would be the trip between Beaumont and Alang and the minimum would be the trip between Beaumont and Tuxpan. These emission estimates are presented in Table 5-1. These emissions are a very small fraction of the total emissions from shipping operations on the ocean and are expected to have minimal impact on overall air quality.

Table 5-1. Oceangoing Tug Air Pollutant Emissions

Pollutant	Minimum Trip (pounds)	Maximum Trip (pounds)
Sulfur dioxide (SO_2)	380	7598
Carbon monoxide (CO)	1548	30954
Hydrocarbon (HC)	704	14070
Nitrogen dioxide (NO_2)	3799	75978

5.3.2. Water Resources

Wastewater would not be generated or discharged from vessels sold for scrapping at any point on the overseas transport routes, and wastewater generated on the tugboats would be discharged only in compliance with national and international requirements. Based on current practices for some tugboat operators, sanitary wastewater generated by the crew is discharged to the ocean only after collection in onboard retaining tanks and pretreatment in an eviscerating system to separate out sludge. The wastewater is then chemically treated and released into the ocean. Bilge water generated on the tugboats during the voyage would likewise be pretreated using separate onboard retaining tanks and discharged to the ocean. Any sludge or oily residue collected during pretreatment of the sanitary wastewater or bilge water would be retained onboard for proper disposal upon reaching port (82). As the vessels are moved through the ocean, they could introduce stormwater to the ocean in their path. However, because the vessels would never be in the same place for an extended time, the magnitude of potential contamination by stormwater is minimal.

5.3.3 Biological Resources

The very limited impacts to water quality from the overseas transport of vessels prior to scrapping (Section 5.3.2) would likewise result in very limited impacts to marine biota. Shallow coral reefs or shoals supporting benthic biota which could be physically damaged by the vessels and tugboats would be avoided due to the risk of damage to the ships. Biologically rich coastal upwelling areas and fringing coral reefs generally occur close to coasts and thus would not be subject to discharges of sanitary wastewater or bilge water from the tugboats. Some barrier coral reefs which occur in the open ocean could be affected by these discharges, but the small volume and pretreatment of the discharges would preclude any biological damage. The slow speeds at which the tugboats would move, less than 6 knots (82), would not be capable of surprising and injuring most marine life, including fish and marine mammals.

5.4 SCRAPPING SITES

Former MARAD vessels sold for scrapping would be handled at established scrapping sites as a part of ongoing operations taking place at each site. Each site regularly accepts vessels for scrapping from a number of sources throughout the world, and former MARAD vessels would generally represent only a small fraction of the total number of ships scrapped at each site. Therefore, environmental impacts from initial establishment of the scrapping facilities would not be attributable to MARAD's ship-scrapping program. Furthermore, potential environmental impacts from the scrapping of former MARAD ships must generally be considered in the context of their representing only a small percentage of impacts from the scrapping of other ships at the same locations.

Environmental consequences are assessed separately for the scrapping sites in Tuxpan, Mexico; Alang, India; and the east coast of the People's Republic of China. The assessments in this section address air, water, and biological resources surrounding each of the scrapping sites and coastal waters crossed by the transport routes between the oceans (or Gulf of Mexico) and the scrapping sites.

5.4.1 Tuxpan, Mexico

Vessels at the Tuxpan site are directed into a man-made side canal parallel to the Tuxpan River that has been specifically created to service the scrapping operation. The vessels are dismantled mechanically, one at a time, using cranes while the ships remain floating in the canal. Large pieces of the ships are transferred by crane to a workyard abutting the canal, where they are manually broken into smaller units and loaded into trucks for transport to a nearby mill. The operation employs approximately 60 workers, who commute from Tuxpan and other nearby communities. No large-scale expansion of the operation is presently planned, although as much as a 15 percent increase in the scrapping rate is anticipated through increases in efficiency (20).

Mexico is not listed as one of the world's principal ship-scrapping countries. In the first quarter of 1993, the People's Republic of China, Pakistan, India, and Bangladesh accounted for 85 percent of the light ship weight (LSW) tonnage scrapped worldwide. All other countries, including Mexico, scrapped the remaining 15 percent. In the first quarter of 1994, this share decreased to approximately 10 percent (14).

5.4.1.1 Air Resources

Air quality impacts on the Tuxpan area related to ship-scrapping operations are due to a variety of sources, including cutting operations, asbestos removal, emptying of fuel tanks, operation of equipment powered by internal combustion engines such as winches, transport of salvage and wastes, and disposal of asbestos. Emissions from these sources are not readily quantified. The scrapping operation at Tuxpan is smaller than at other sites, with one ship handled at a time. Therefore, emissions from the scrapping of former MARAD ships represent most of the emissions from the scrapping yard during the period that these ships are disassembled.

Oxyacetylene torches are used to cut ships into steel plate that can be transported to a mill for recycling. The use of oxyacetylene torches results in emissions of fumes, the major components of which are iron, manganese, silicon, and nickel. Cutting operations also result in emissions of gases including nitrogen oxides, ozone, and carbon monoxide. Some emissions of lead may also result from the burning of lead paint on the metal surfaces. Fumes are particles formed from vaporizing and then condensing electrode and base metal constituents. These particles tend to agglomerate and settle. The fraction of these particles that may stay suspended long enough to disperse offsite is unknown. Operation of one cutting torch continuously over a 10-hour workday would result in less than 1 pound of fume emissions (84). The number of cutting torches used to disassemble a ship has not been quantified.

Removal of asbestos material and the handling of this material can result in emissions of asbestos. Emissions of asbestos from salvage operations are not readily quantified, since it is not known how asbestos material is handled, disposed of, or recycled.

Some volatile organic compounds may be emitted from the emptying of fuel tanks, from tanks used to store fuel, and from fuel spills. Operation of internal combustion engines for generators, cranes, and winches in the salvage yard would result in emissions of sulfur dioxide, carbon monoxide, hydrocarbons, nitrogen dioxide, and particulate matter.

5.4.1.2 Water Resources

No information is available that specifically details water quality impacts during vessel-breaking operations at the Tuxpan site. Vessels sold by MARAD for scrapping would be broken at the Tuxpan site in the same manner that other vessels have been, and they would not represent a new or increased source of water pollution in the side canal or in the Tuxpan River.

Water in the side canal would be subject to falling debris and to leaks of oils and fuels as the former MARAD vessels are broken. Any hazardous materials that are an integral part of the vessels at the time of scrapping could fall into the side canal and affect water quality. Any paint on debris falling into the water could slowly dissolve in the water. Much of the accumulated bird droppings known to occur on the former MARAD vessels could be blown or brushed into the side canal waters during the breaking operations, causing localized nutrient enrichment and possible algal blooms.

Because vessels are not beached in sand or mud at the Tuxpan site prior to scrapping, the turbidity of waters in the side canal and Tuxpan River should not be substantially affected each time a vessel is moved in for scrapping.

5.4.1.3 Biological Resources

Tugboats transporting former MARAD vessels to the Tuxpan site would follow existing, well-traveled navigation channels through the nearshore waters of the Gulf of Mexico into the Tuxpan River to the side canal. Sensitive aquatic habitats such as coral reefs and coastal marshes in the Gulf of Mexico and the Tuxpan River downstream of the scrapping site would not be affected by the transport of the vessels. As indicated in Section 5.3.2, wastewater would be discharged from the tugboats only in compliance with national and international requirements, and thus the water quality of the coral reefs, coastal wetlands, and other nearshore waters of the Gulf of Mexico or Tuxpan River downstream of the scrapping site would not be affected.

Aquatic biota living in the waters of the side canal and in the Tuxpan River near the entrance to the side canal would be subject to water quality changes and to physical injury during the scrapping of former MARAD vessels. However, biota have already experienced these conditions for years and would continue to experience them regardless of any decisions concerning the former MARAD vessels.

Lands within the scrapping site are already in a highly disturbed condition as a result of ongoing operations and therefore do not provide suitable habitat for terrestrial wildlife. Scrapping of former MARAD vessels would not result in the deterioration or loss of any additional vegetation or wildlife habitat. Terrestrial biota in habitats adjoining the scrapping site are presently subject to substantial noise from ongoing scrapping operations; the character of this noise would not be expected to differ while former MARAD vessels are being scrapped.

Transport of the former MARAD vessels could introduce eggs, seeds, or other propagules of plants, insects, or other biota indigenous to or adapted to the United States to Mexican habitats surrounding the Tuxpan site. The deep accumulations of bird droppings and other biomatter on the vessels could have entrapped propagules for a number of species while the vessels lay undisturbed at anchor. These introduced species could be capable of reproducing in habitats near the Tuxpan site and experience population explosions if no natural predators were present.

5.4.2 Alang, India

Vessels at the Alang site are beached on a roughly 4-mile stretch of mudflats on the Gulf of Cambay and broken by hundreds of mostly unskilled laborers using largely manual methods. The beach comprises 80 parallel lots, each between 200 and 300 feet wide and each accommodating one vessel at a time for scrapping (67).

India is one of the major scrapping locations in the world. In the first quarter of 1993, India's share of worldwide LSW tonnage scrapped was approximately 25 percent, while in the first quarter of 1994, its share was 35 percent (14).

5.4.2.1 Air Resources

Air quality impacts at Alang related to ship-scrapping operations would be similar to those described for Tuxpan, although some emissions such as fugitive dust could be greater due to the less sophisticated methods used to dismantle ships. However, the potential for emissions of asbestos is less, since they are controlled at the Alang site by identifying, removing, and bagging the asbestos material on the ship.

5.4.2.2 Water Resources

No information is available that specifically details water quality impacts during vessel-breaking operations at the Alang site. Vessels sold by MARAD for scrapping would be broken at the Alang site in the same manner that other vessels have been, and they would not represent a new or increased source of water pollution in the Gulf of Cambay.

It is likely that the methods traditionally used to beach and break vessels at Alang would also be used for the former MARAD vessels. Vessels are driven into the mud and sand of the beach at high force, with the goal of embedding them as deeply as possible (18, 85). Large quantities of sediments therefore become resuspended in the nearshore waters, increasing their turbidity and allowing contaminants in the sediments to reenter the water column. Vessels are broken by crews of laborers using manual labor and limited heavy equipment. The continuous passage of numerous laborers through the shallow water surrounding the beached vessels creates additional sediment resuspension. Tar and oil have been reported to seep out of vessels into the shallow water at the beach as they are broken (86). These water quality impacts could be expected from the scrapping of any vessel at the Alang site and are not unique to the former MARAD vessels.

Any hazardous materials that are an integral part of the former MARAD vessels at the time of scrapping could fall into the shallow waters at the beach. Any paint on debris falling into the water could slowly dissolve in the water. Much of the accumulated bird droppings known to occur on the vessels could be blown or brushed into the water during the breaking operations, causing localized nutrient enrichment and possible algal blooms.

Because former MARAD vessels would represent a small part of the total scrapping activity at Alang, water quality near the beach would not be expected to change appreciably during the period in which the vessels were being scrapped. The decision to sell MARAD vessels for scrapping at Alang would not likely affect water quality, since vessels from other sources would continue to be scrapped there.

5.4.2.3 Biological Resources

Tugboats transporting former MARAD vessels to the Alang site would follow existing, well-traveled navigation channels through the Arabian Gulf into the Gulf of Cambay. As indicated in Section 5.3.2, wastewater would be discharged from the tugboats only in compliance with national and international requirements, and thus the water quality of any sensitive coastal habitats in the Arabian Sea or Gulf of Cambay would not be affected by wastewater discharges. As the ships designated for scrapping approach the beach at Alang, they could scrape bars and shoals near the shore (69) before becoming grounded for the breaking operation. Benthic biota present in these areas would be subject to physical disturbance, and any aquatic biota in the surrounding waters would be adversely affected by the resulting sedimentation. Potentially affected bars and shoals currently experience frequent passage of vessels and, consequently, are already subject to the effects noted above.

Ecologists are reported to be strongly opposed to the process used to break vessels at Alang (87). Under these methods, aquatic biota living in shallow waters near the beach are subject to water pollution, as described in Section 5.4.2.2. Benthic biota near the beach are subject to physical disturbance as vessels are beached and as solid debris is dropped into the water and collected by laborers. Repeated resuspension of sediments during the breaking process keeps the water in a state of high turbidity which may suffocate benthic biota, impede the movement of fish, and block light required for the growth of phytoplankton and submerged vegetation. However, these conditions have existed for years and would continue regardless of any decisions concerning the former MARAD vessels.

Land within the scrapping site is of limited value as habitat for terrestrial wildlife. The beach at Alang has been described as a "ravaged landscape" (85), already in a highly disturbed condition as a result of ongoing scrapping operations. Any remaining terrestrial wildlife on or near the beach are subject to injury from frequent fires and explosions (85, 86). Scrapping of former MARAD vessels would not result in the deterioration or loss of any additional vegetation or wildlife habitat. Terrestrial biota in habitats adjoining the beach are presently subject to substantial noise from ongoing scrapping operations; the character of this noise would not be expected to differ while former MARAD vessels were being scrapped.

Transport of former MARAD vessels could introduce eggs, seeds, or other propagules of plants, insects, or other biota indigenous to or adapted to the United States to Indian habitats surrounding the Alang site. Accumulated bird droppings and other biomatter on the vessels could have entrapped propagules for a number of species while the vessels lay undisturbed at anchor. These introduced species could be capable of reproducing in habitats near the Alang site and experience population explosions if no natural predators were present.

5.4.3 East Coast of the People's Republic of China

Scrapping methods resembling those at Tuxpan (involving man-made docking or berthing facilities and primarily mechanized dismantling) and at Alang (involving beaching the vessels and primarily manual dismantling) are utilized on the Chinese coast, depending on location (87). In addition, ships may be dismantled in dry docks (using primarily mechanical means). Due to their smaller size, many MARAD ships are scrapped at berthing facilities; none have been broken in dry docks (12). Thus, the environmental consequences of scrapping former MARAD ships would most often parallel those described for Tuxpan (Section 5.4.1). Where vessels are beached, impacts would be similar to those described for Alang (Section 5.4.2).

The People's Republic of China is one of the world's major scrapping locations. Approximately 40 percent of the worldwide LSW tonnage scrapped in the first quarter of 1993 was dismantled in the People's Republic of China, while in the first quarter of 1994 the country's market share was 30 percent (Braemar, 1994).

5.4.3.1 Air Resources

Air quality impacts on the coastal areas of the People's Republic of China related to ship-scrapping operations are caused by a variety of sources, including cutting operations and would be similar to those described for Tuxpan (Section 5.4.1.1.). The potential for emissions of asbestos is less, since they are controlled by identifying, removing, and bagging the asbestos material on the ship.

5.4.3.2 Water Resources

Impacts to water resources at any scrapping site on the Chinese coast would generally be as described for the Tuxpan site (Section 5.4.1.2) or the Alang site (Section 5.4.2.2), depending upon the breaking methods in use at that site. Vessels sold by MARAD for scrapping would be broken by whatever methods are already in use at the site, and they would not represent a new or increased source of water pollution.

Any hazardous materials that are an integral part of former MARAD vessels at the time of scrapping could fall into the water. Any paint on debris falling into the water could slowly dissolve. Booms are used to contain any oil that may be spilled while a ship is being scrapped (12). Much of the accumulated bird droppings known to occur on the vessels could be blown or brushed into the water during the breaking operations, causing localized nutrient enrichment in the water and possible algal blooms.

Because former MARAD vessels would represent only part of the total scrapping activity at each site, water quality near the sites would not be expected to change appreciably during the period in which the vessels were being scrapped. The decision to sell MARAD vessels for scrapping at any site would not likely affect water quality, since vessels from other sources would continue to be scrapped there.

5.4.3.2 Biological Resources

Impacts to biological resources at any scrapping site on the Chinese coast would generally be as described for the Tuxpan site (Section 5.4.1.3) or the Alang site (Section 5.4.2.3). Because former MARAD vessels would represent only part of the ongoing scrapping activity at each site, the conditions faced by aquatic and terrestrial biota living near the sites would not substantially change during the period in which the vessels were being scrapped.

Tugboats transporting former MARAD vessels would generally be expected to follow existing, well-traveled navigation channels. Sensitive aquatic habitats such as coral reefs and coastal marshes would generally not be affected by the transport of the vessels. As indicated in Section 5.3.2, wastewater would be discharged from the tugboats only in compliance with national and international requirements; thus, effects on sensitive nearshore habitats would be avoided.

Aquatic biota living in the waters near the sites would be subject to water quality changes and to physical injury by the scrapping of the former MARAD vessels. However, it is expected that aquatic biota at each site have already experienced these conditions for years and would continue to experience them regardless of any decisions concerning the MARAD vessels. The use of booms to contain spilled oil would help reduce impacts to the aquatic environment.

It is expected that lands within the scrapping sites are already in a highly disturbed condition as a result of ongoing operations and therefore do not provide suitable habitat for terrestrial wildlife. Scrapping of former MARAD vessels would not result in the deterioration or loss of any additional vegetation or wildlife habitat at such sites. Terrestrial biota in habitats adjoining scrapping sites are presently subject to substantial noise from ongoing scrapping operations; the character of this noise would not be expected to differ while former MARAD vessels were being scrapped.

Transport of the former MARAD vessels could introduce to Chinese habitats surrounding the scrapping sites eggs, seeds, or other propagules of plants, insects, or other biota indigenous to or adapted to the United States. Accumulated bird droppings and other biomatter on the vessels could have entrapped propagules for a number of species over the several decades that the vessels lay undisturbed at anchor. These introduced species could be capable of reproducing in habitats near the scrapping sites and experience population explosions if no natural predators were present.

Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*, requires that Federal agencies having responsibility for authorizing and approving an action encompassed by the order be informed of pertinent environmental considerations when making decisions regarding the action. Since obsolete Maritime Administration (MARAD) vessels sold for scrapping are, due to world market conditions, scrapped in foreign nations, Executive Order 12114 applies. Specifically, MARAD's action falls under Section 2-3, "Actions Included," Subsection (c)(1). According to Section 2-4, "Applicable Procedures", Subsections (a)(iii) and 2-4 (b)(iii), MARAD must prepare a concise review of the environmental issues resulting from its actions. This document fulfills the environmental documentation requirements of the executive order.

Potential effects on air quality, water quality, and biological resources from the removal of ships from the reserve fleets and their transport to the scrapping sites would be very limited. Air emissions from the engines of tugboats used to transport the obsolete vessels would be minimal in relation to similar emissions from other oceangoing vessels. Any accumulated, nonoily water in the obsolete vessels would be discharged at a domestic port prior to oceanic transport. Small quantities of sanitary wastewater could be discharged from the tugboats, but only in compliance with national and international requirements. Initial movement of the vessels from their anchorages at the National Defense Reserve Fleet (NDRF) sites would disturb any biota which presently use the vessels as habitat. Hazardous materials are removed from the obsolete vessels; however, varying quantities of fuel oil remain on board. Polychlorinated biphenyls (PCBs) and asbestos that are an integral part of the vessels' operating structure are not removed prior to sale.

At present MARAD has 214 ships in the NDRF. By 1998 it is projected that 78 of these vessels will be sold for scrapping. Sales within the next two years are not likely to represent more than 3 percent of the worldwide scrapping tonnage. At this level, the sale of former MARAD vessels would not be expected to impact the local scrapping site environments more than at present. Each of the sites at which former MARAD ships are scrapped is well established and has been in operation for a number of years. Thus, the air, water, and biotic resources within and in the immediate vicinity of the sites have already been affected in a number of ways by ongoing activities. For example, land disturbance has already resulted in the loss of terrestrial habitats and displacement of wildlife. Also, continuing operations have affected air and water quality. The environmental conditions at the scrapping sites would not noticeably change during the period in which ships originating from NDRF sites were dismantled. However, some minimal degradation of air and water quality would result from the scrapping of former MARAD ships. Likewise, biotic resources, especially aquatic biota, would be minimally impacted during scrapping operations.

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