USACE CONTRACT NO. DACW33-94-D-0002
TASK ORDER NO. 017
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

UNDERWATER ARCHEOLOGICAL REMOTE SENSING SURVEY NEW BEDFORD HARBOR SUPERFUND SITE

New Bedford, Massachusetts

January 2000
(Revised March 2001)

Prepared for

Foster Wheeler Environmental Corporation
133 Federal Street
Boston, Massachusetts 02110

and

U.S. Army Corps of Engineers
New England District
696 Virginia Road
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ABSTRACT

This report describes the results of an underwater archeological remote sensing survey carried out for the New Bedford Harbor Superfund Project in the towns of New Bedford, Fairhaven and Acushnet. Tasks performed included: a review of documentary and background research; development of a maritime historical overview of New Bedford Harbor; and magnetic and acoustic remote sensing of portions of the Upper, Lower, and Outer harbors with follow-up target analysis. In addition, seismic (sub-bottom) and bathymetric data were collected during fieldwork activities. The purpose of these investigations was to determine the presence or absence of submerged cultural resources potentially eligible for the National Register of Historic Places that might be affected by dredging to remove contaminated sediments. Analysis of remote sensing data identified sixty magnetic and/or acoustic targets. The vast majority of the targets appear to be related to isolated, single source objects, modern debris, or shoreline-related objects. Two of the remote sensing targets are suggestive of submerged cultural resources. If avoidance at these two target locations is not possible, additional underwater archeological investigation is recommended.

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1.0 INTRODUCTION

1.1 Site/Project Location

The New Bedford Harbor Superfund Site (the site) is located in Bristol County, Massachusetts. It extends from the shallow northern reaches of the Acushnet River estuary south through the commercial port of New Bedford Harbor and adjacent areas of Buzzards Bay. The harbor is flanked by the City of New Bedford on the west and the Town of Fairhaven on the east. The main portion of the harbor, the area between the Route 6 bridge and the hurricane barrier (see Figure 1-1), is naturally deep and is the home for one of the largest commercial fishing fleets in the country. In addition to the commercial fishing vessels, hundreds of recreational sail and powerboats are berthed and moored at marinas and in the various coves that are located across New Bedford Harbor. The sediments in the harbor are contaminated with high concentrations of many pollutants, notably PCBs and heavy metals from the industrial and urban development surrounding the harbor.

The site has been divided into three areas - Upper, Middle, and Outer Harbor - based on geographical features and levels of contamination (see Figure 1-1). The Upper Harbor extends from an area slightly north of the Wood Street Bridge to the Coggeshall Street Bridge. The Middle Harbor extends from Coggeshall Street Bridge to the Route 6 bridge. The Outer Harbor is the area between the hurricane barrier and an imaginary line drawn from Rock Point southwesterly to Negro Ledge and then southwesterly to Mishaum Point.

1.2 Project Background Information

From the 1940s into approximately the 1970s, two electrical capacitor manufacturing plants in the New Bedford area discharged PCB waste either directly into the harbor or indirectly through discharges to the city's sewerage system. In the mid-1970s, as a result of EPA sampling, PCBs were identified in the sediments and the seafood in the New Bedford Harbor area. In 1979, the Massachusetts Department of Public Health issued regulations prohibiting fishing and lobstering throughout the site due to high levels of PCB contamination ranging from below detection limits to higher than 100,000 parts per million (ppm) in various parts of the harbor. The site was included on the Superfund National Priorities List (NPL) in September 1983. EPA's site-specific investigations were initiated in 1983-1984, and included engineering feasibility studies of alternative dredging methods and disposal of contaminated sediments, pilot dredging and disposal studies to field test different dredging and disposal technologies for the contaminated sediments, and extensive physical and chemical computer modeling of the site.

The EPA and USACE entered into an Inter-Agency Agreement in February 1998 that gives the USACE responsibility to provide technical assistance to EPA on New Bedford Harbor. In October 1998, EPA authorized the USACE to perform remedial design activities associated with the Upper and Lower New Bedford Harbor cleanup.

1.3 Project Description

In September 1998, after years of study, public debate, and consensus building, EPA selected a cleanup remedy for the entire Upper and Lower Harbor areas as a solution to the widespread PCB

contamination in New Bedford Harbor. The remedy involves the dredging of about 170 acres and containment of approximately 450,000 cubic yards (cy) of PCB contaminated sediment in CDFs. In the Upper Harbor north of Coggeshall Street, sediments with PCB concentrations above 10 ppm will be dredged, and in the Lower Harbor and in salt marshes, sediments above 50 ppm will be dredged. Intertidal sediments in specific areas adjacent to homes and in areas prone to beachcombing will be removed if PCB levels are above 1 and 25 ppm, respectively.

Dredged sediments will be removed from the harbor and pumped to four confined disposal facilities (CDFs) to be constructed along the New Bedford Harbor shoreline. The CDFs will be used to permanently isolate the sediments from the public and the marine environment. The limits of the project areas and the approximate locations of the four CDFs are shown in Figure 1-2. Note that wetland areas subject to beachcombing and areas adjacent to residential areas that may require remediation have not been identified for the Lower Harbor. No dredging is presently planned for the portion of the Lower Harbor south of the Route 6 bridge and north of the hurricane barrier. Each of the CDFs will be capped following the completion of dredging operations and an appropriate period for sediment consolidation.

The CDFs in the Upper Harbor include A, B, and C with layouts as shown in Figure 1-3, 1-4, and 1-5. The conceptual design for CDFs A, B, and C includes earthen embankments on the water side and sheet pile walls on the land side. The structures will isolate the sediments from the environment through a combination of sediments with inherently low permeability and flexible membrane liner (FML) material placed on the interior slopes of the CDFs.

The largest CDF (CDF D) will be located in the Lower Harbor. The conceptual design for this facility includes sheet pile walls on each of four sides of the structure. The long-term objective for this CDF is to facilitate economic development of the New Bedford Harbor waterfront.

In addition to the design and construction of the CDFs, the project includes the relocation of storm drains (SDs) and combined sewer overflows (CSOs), and construction and operation of water treatment facilities to treat the water generated during the dredging and sediment dewatering processes. The water treatment systems will be designed to treat the supernatant from the CDFs.

1.4 The Cultural Resources Program

The USACE has tasked its contractor, Foster Wheeler Environmental Corporation (Foster Wheeler), with a number of pre-engineering and engineering design tasks required to implement the selected cleanup remedy. As per 40 CFR 300.400e, Foster Wheeler is not required to obtain permits and/or waivers from federal, state, or local regulatory agencies for on-site environmental activities associated with EPA's remedial action at the New Bedford Harbor Superfund Site. All activities associated with the CDF, CSO, SD, and associated utility relocations are proximate enough to the site to be considered "on-site activities" related to the remedial action for the New Bedford Harbor Superfund Site. However, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), EPA, USACE, and their contractors must address and comply with Applicable or Relevant and Appropriate Requirements (ARARs) including the National Historic Preservation Act (NHPA).

Foster Wheeler has contracted with John Milner Associates, Inc. (JMA) to provide assistance and support in collecting, interpreting, and analyzing information about cultural resources which can, in turn, be used by EPA and USACE to satisfy those agencies' obligations under Section 106 of the

National Historic Preservation Act. JMA is being assisted by Dolan Research, Inc. in the area of underwater archeological research (including interpretation and analysis of remote-sensing data) and maritime history. JMA and Dolan Research are also being assisted by CR Environmental (CR). CR, as a subcontractor to JMA, was responsible for providing and operating vessels and the majority of remote sensing equipment used during the cultural resources program. To date, Foster Wheeler has contracted with JMA to prepare a background literature review and archeological sensitivity study, perform an architectural historical survey and inventory, and conduct a marine geophysical/archeological survey.

On July 21, 1999 personnel from JMA, Foster Wheeler, Dolan Research and USACE met with staff representatives of the Massachusetts Historical Commission (MHC) and the Massachusetts Board of Underwater Archaeological Resources (MBUAR) to discuss various aspects of the project. Topics covered included permitting of proposed upland and underwater archeological investigations, proposed scopes of work, and the definition of an Area of Potential Effect (APE) for the project.

This report describes the results of the underwater archeological remote sensing survey and background research related to the maritime history of the project area. On August 29, 1999, Dolan Research submitted a reconnaissance permit application to the MBUAR. The MBUAR subsequently advised Dolan Research that a permit would not be required for the level of investigation being proposed.

The results of the architectural/historical survey and inventory and the archeological literature review and sensitivity study are presented in separate reports.

2.0 MARITIME HISTORICAL OVERVIEW

2.1 Methodology

Prior to conducting fieldwork investigations, background research was undertaken to develop a generalized historic maritime context of the New Bedford Harbor for evaluation of potential historic submerged sites. In addition to inspecting primary and secondary historical data, background research efforts included a records check for known archeological sites and National Register properties in the New Bedford project area and vicinity, and a review of Massachusetts state underwater archeological site files and prior technical reports.

While the emphasis of background research focused on maritime activity in the New Bedford Harbor, a broad-based historic overview was essential for providing the proper framework for assessing the potential significance of submerged cultural resources. Historic maps, secondary and primary shipwreck lists, primary historical accounts, newspapers, and county and thematic histories helped to identify a set of expected resources in New Bedford Harbor. During the course of background research staff contacted local archaeologists, watermen, sport and commercial divers, knowledgeable professional and avocational historians, and interested lay persons who may possess knowledge of the harbor area. Project staff also visited local and county libraries and historical societies. National repositories were also consulted while compiling data for the historic overview. At the National Archives, a variety of record groups contain information on shipwrecks, ship construction, naval activity, and maritime trade activities. Site specific research, pertaining to individual vessels was reviewed at Peabody Essex Museum, Salem, Massachusetts; New Bedford Whaling Museum, New Bedford, Massachusetts; and Independence Seaport Museum, Philadelphia, Pennsylvania. At each repository, computer indexes were inspected for references to specific ship-types, and maritime activity in and around New Bedford. In addition, sources were checked for data concerning potential shipwreck sites in New Bedford. Primary and secondary sources for shipwreck sites were also accessed during the collection of background data.

Information gathered during the background research was used to generate a framework for the project vicinity. The historical framework identified types of resources that may have been deposited in the New Bedford Harbor vicinity, and to determine the nature and extent of subsequent activities that may have removed or disturbed such resources. Each target or site identified during the fieldwork was analyzed and evaluated for potential historical significance within the context of this framework.

2.2 Maritime Historical Overview – New Bedford Harbor

Europeans first documented the Acushnet River and vicinity in 1602 when Englishman Bartholomew Gosnold, aboard the bark *Concord* sailed into the region after sailing from Falmouth, England (Baker, 1980). However, the first permanent European settlement in the study area did not start until 1652 when settlers from Plymouth bought the land presently encompassing Dartmouth, New Bedford, Fairhaven and Westport. New Bedford was part of Dartmouth until the old township was divided in 1787. Fairhaven and New Bedford remained as one township until 1812 (Ricketson, 1858). New Bedford's spacious and naturally deep harbor became an ideal location for the development of the fisheries industry. Whaling soon became the

primary industry in New Bedford and Fairhaven. The first whalers in the colonies left from Nantucket and New Bedford as early as 1690.

The country's whaling fleet initially centered on Nantucket Island, began to consolidate on the mainland at and around New Bedford after the Revolutionary War. In 1765, there were only two or three small vessels employed in the whale fishery at New Bedford. In that year, Joseph Russell operated the sloops *Nancy*, *Polly*, *Greyhound*, and *Hannah* (all between 40 and 60 tons) in the local whaling industry. Other boats built and operated by Mr. Russell include; *Joseph & Judith*, *Patience*, *No Duty on Tea*, *Russell*, and *Rebecca*. Russell was instrumental in founding the town of New Bedford to serve as homeport for his growing fleet of whaling vessels. As the principle landowner, Russell had designed the town from the start to be a whaling center. In sub-dividing and selling off his tract, Russell provided sites for shipwrights, boatbuilders, blacksmiths, coopers and other artisans essential to the fishery industry. (Kugler, 1980). Other notable early vessels launched at New Bedford include the merchant vessel *Dartmouth*. She was owned by Francis Roth and later became one of the vessels involved in the Boston Tea Party demonstration in Boston Harbor (Ricketson, 1858).

Another prominent family associated with the formation of New Bedford was the Rotch family. Joseph Rotch and his sons, initially of Nantucket, moved to New Bedford in 1767. They soon became the leading whaling merchants in the colonies. In 1768, Rotch also built New Bedford's first candleworks (Kugler, 1980).

By 1775, almost 50 boats were involved with the expanding whaling industry. However, the British destroyed the eighteenth century whaling industry in Massachusetts during the Revolutionary War. Almost the entire whaling fleet of New Bedford was wiped out during the Revolution: only four or five ships remained out of 200 sail before the war; the rest were lost, buried or captured (Morisson, 1921).

New Bedford was active during the Revolutionary War. Early in the war, New Bedford and Fairhaven inhabitants constructed a fort on the east-side of the Acushnet River at Nobscot. Many privateers were fitted out of Boston and Providence, and many of the prize vessels they captured were sent to New Bedford. Once the British discovered the town was stored with prize goods of every description, Sir Henry Clinton dispatched an expedition under the command of General Gray. On September 5, 1778, a British fleet that consisted of 32 vessels, the largest of which was a 40-gun ship, entered Clark's Cove and formed a bridge of boats to the shore. Approximately 4,000 or 5,000 British soldiers and sailors landed at New Bedford to destroy the vessels in the harbor. Local resident, Mr. Gilbert Russell listed 34 ships that the British destroyed: seven ships, one barque, one snow, eight brigs, seven schooners, and 10 sloops (Russell, cited in Ricketson, 1858).

After the war, the whaling industry slowly revived. It took several years after the peace before any vessels were fitted out in New Bedford. In 1787, there was only one ship (180 tons) and 2 or 3 brigs in the business; but soon after this period the whaling industry revived (Ricketson, 1858). In the last decade of the eighteenth century, both New Bedford and Fairhaven competed with Nantucket and began their rise to world prominence in the whale trade. In 1789, more than 100 whaling vessels operated out of Massachusetts, mostly from Nantucket and New Bedford. In the 1790s New England whalers headed into the Pacific Ocean for the first time. Related maritime industries sprung up in New Bedford, and particularly Fairhaven, in support of the whaling industry, including shipbuilding, ropewalks, and candle factories.

In addition to whaling, merchants also began to ship cargo out of New Bedford after the Revolutionary War. In 1802, some 20 square-rigged merchantmen were sailing from New Bedford. They were carrying cargoes from New York and the southern ports of Europe. Occasionally, voyages were made to the East and West Indies directly from New Bedford. By 1807, New Bedford's waterfront had seven commercial wharves, between 90 and 100 ships and brigs, containing each on an average 250 tons, and between 20 and 30 small vessels: Twelve of the ships were whalers. By that year, three ropewalks were established in New Bedford and one in Fairhaven. Water depth in the harbor was reported between 18 and 24 feet (Ricketson, 1858).

During the War of 1812, the Navy Department provided four Jeffersonian gunboats for defense in Massachusetts; two at Newburyport and two at New Bedford. However, they proved useless. The two New Bedford boats remained hidden in the Acushnet River and did not even attack the *Nimrod* when she stranded on Great Ledge offshore New Bedford. Quaker shipowners who made fortunes by neutral trading before 1812, perceived the future of commerce trading from New Bedford was limited and refitted most of their vessels' as whalers. Typically, local shipowners converted their merchant ships that had outlived their usefulness in the trade service into whalers, a shiptype that required capacity rather than speed as its main attribute (Morison, 1921).

In 1796, a company was created to construct the first bridge across the Acushnet River to connect New Bedford with Fairhaven and Oxford. The bridge was 4,000 feet long including abutments and the two islands it crossed over. The initial bridge was swept away in March, 1807 and was rebuilt later that year. In September, 1815, the second bridge was also washed away. A third bridge was built over the Acushnet River in 1819 and was still being used as of 1858. It was reported that the bridge significantly contributed to the shoaling up of the harbor (Ricketson, 1858). Despite the presence of a bridge, ferries connecting Fairhaven and New Bedford remained active for more than 100 years. The last of these ferries, the Fairhaven, a small side wheel steamer was launched into service on February, 24, 1896. Typically, she made 19 daily roundtrips across the Acushnet River (Whitman, 1994).

New Bedford was made a city in 1847. Whaling was the primary industry and remained so for most of the nineteenth century. In 1838 there were 170 whaling vessels in New Bedford. By 1857, New Bedford's whaling fleet surpassed all other Massachusetts ports combined with 329 whalers, with a tonnage of 111,364 (Sayer, 1889). Fairhaven provided most of the support services required by the whaling industry. With oil refineries, coopers shops, tool works and the other industries subsidiary to whaling, New Bedford Harbor became a center of industry. It became the fifth largest port for shipping in the country. Whaling and the manufacture of whaling products became the leading industry in Massachusetts after shoes and cotton and provided commerce with an important export medium (Morison, 1921). However, by 1888, whaling had declined dramatically. Only 74 whalers worked out of New Bedford in that year, with a tonnage of 18,911 (Sayer, 1889).

New Bedford was an urban center and was served by several steamboat lines during the nineteenth and twentieth centuries. Steamboat service from New Bedford to Nantucket dates to 1829, when Jacob Barker's steamer *Marco Bozzaris* made three trips a week. The New Bedford and Martha's Vineyard Steamboat Company was formed in 1846. In that year, the steamer *Naushon* made three trips a week between Edgartown and New Bedford, with a stop at Woods Hole (Foster & Weiglin, 1989). Steamboat service between New Bedford and New York began in 1853. The New Bedford and New York Steamship Company occupied a long, narrow roofed over wharf that could accommodate the large steamers operating in Long Island Sound (Whitman, 1994). Their boats connected with the Boston, Clinton & Fitchburg Railroad. In 1879

the Old Colony Steamboat Line took over the New Bedford-New York line (Foster & Weiglin, 1989). A second steamboat line, New Bedford, Martha's Vineyard and Nantucket Steamboat Company started service between New Bedford and the two islands in 1854. Assets from this company passed thorough several mergers and were acquired by the New England Steamship Company in 1945. Ships from the Fall River Steam Ship Line also served New Bedford.

Overfishing, a cheaper source of oil, and the Civil War, (Confederate Commerce Raiders captured and destroyed a vast number of New Bedford whalers on the high seas) combined to reduce the role of the whale industry and related maritime commerce. More than 50 whaling vessels were captured by rebel cruisers, 28 of which sailed out of New Bedford. All but a few of the whalers were burned. In June 1865, Confederate Cruiser *Shenandoah* alone captured 25 whalers in Behring strait. Many other whalers were bought by the government during the Civil War. Forty New Bedford whalers purchased by the United States formed the major portion of the two famous stone fleets which in 1861 were sunk off the harbors of Charleston and Savannah to impede blockade runners and privateers (Sayer, 1889). Numerous whalers were also lost in Arctic ice. In September 1871, 33 whaling ships (22 from New Bedford) were crushed by ice in the Arctic Ocean. Arctic mishaps in 1876 and 1888, claimed 17 more whaling ships. Ultimately, the future of whaling as a source of oil was sealed once Colonel Drake discovered oil in the ground in northwestern Pennsylvania in 1859.

By the end of the nineteenth century, whaling had given way to textile mills as the leading industry in the New Bedford economy. Cotton mills, ushered in with the advent of the Industrial Revolution, began to replace the fish-processing and candle-making plants on the New Bedford waterfront. And with the decline of whaling, the shipyards and associated maritime industries were slowly abandoned. It was not until the after the First World War when the introduction of diesel powered fishing boats allowed vessels to economically reach the rich offshore fishing banks that New Bedford once again became a prominent fishing port.

3.0 SUBMERGED CULTURAL RESOURCES

3.1 National Register of Historic Places Evaluation Criteria

Nautical vessels and shipwreck sites are generally, excepting reconstructions and reproductions, considered historic if they are eligible for listing in the National Register of Historic Places. As set forth at 36 CFR 60.4, to be eligible for the National Register of Historic Places, a vessel or site must be significant "in American history, architecture, archeology, engineering, or culture" and "possess integrity of location, design, setting, materials, workmanship, feeling, and association" and meet one or more of the following criteria:

a. be associated with events that have made a significant contribution to the broad patterns of our history; or

b. be associated with the lives of persons significant in our past; or

c. embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

d. have yielded, or may be likely to yield, information important in prehistory or history.

National Register of Historic Places Bulletin 20 clarifies the National Register review process with regard to shipwrecks and other submerged cultural resources. Shipwrecks must meet at least one of the above criteria and retain integrity of location, design, settings, materials, workmanship, feelings and association. Determining the significance of a historic vessel depends on establishing whether the vessel is:

1. the sole, best, or a good representative of a specific vessel type; or

2. is associated with a significant designer or builder; or

3. was involved in important maritime trade, naval recreational, government, or commercial activities.

Properties that qualify for the National Register must have significance in one or more "Areas of Significance" that are listed in *National Register Bulletin* 16A. Although 29 specific categories are listed, only some are relevant to the submerged cultural resources in New Bedford Harbor. Architecture, commerce, engineering, industry, invention, maritime history and transportation are potentially applicable data categories for the type of submerged cultural resources that may be expected in the Acushnet River study area.

3.2 Shipwrecks in the New Bedford Vicinity

A wide variety of shipwrecks may exist in New Bedford's harbor. Historic records indicate that maritime activity in the region's waterways dates to the first decade of the seventeenth century. The first documented shipwreck losses in the region are associated with Revolutionary War

activity in September 1778. In the nineteenth century, New Bedford became the principal whaling port in the country and was home for hundreds of square-rigged whalers. Although whaling was phased out as an industry by the end of the nineteenth century, New Bedford has remained a preeminent commercial fishing port throughout the twentieth century. Shipwrecks undoubtedly occurred in and around New Bedford harbor during each phase of the port's historical development. However, it is highly unlikely that any intact wrecks remain within the navigable portions of the harbor, since they would have been removed long ago as a hazard to navigation. Nonetheless, a list of shipwrecks and derelict vessels provides insights into the expected vessel types that might be found in and around New Bedford.

A number of sources were accessed during the compilation of wrecked vessels in New Bedford's Harbor. The lists have been divided according to the sources. In all, more than 65 different vessels are documented as wrecked in or around New Bedford Harbor.

The following is a shipwreck list maintained at the Massachusetts Board of Underwater Archaeological Resources (MBUAR). It was provided by Mr. Victor Mastone, MBUAR Director. The vast majority of the sites included in the list were derived from data gathered by Mr. Brad Luther, local expert on New Bedford Harbor, and Mr. John Fish, an underwater researcher.

Name	Date	Type	Where
Wasp	6/12/1903	Barge	New Bedford
Thomas H. Lawrence	9/21/1938	Schooner	West of Palmer's Island, New Bedford Harbor
H.M.S. *Nimrod*	1815		Mass. Location Database
Unidentified	1/7/1844	Schooner	Near New Bedford
Rival	10/14/1844	Brig	Ashore at New Bedford
Caravan	11/6/1847	Schooner	Off New Bedford
Chopaquoit	1947	Ketch	Off West Beach, Westport
Aloha	3/13/1870	Bark	New Bedford
A. Francis Edwards	5/26/1892	Schooner	New Bedford
Freeman	9/15/1898	Schooner	New Bedford
Rattler	10/13/1915	Oil	New Bedford
Sally W. Ponder	10/9/1916	Schooner	New Bedford
Lorna	11/1923	Gas	New Bedford
Mogadore	9/11/1930	Gas	New Bedford
Althea Louke	12/4/1932		New Bedford
Eurybia	8/9/1935	Gas	New Bedford
Winifred	9/21/1938	Oil	New Bedford
Alma Bell	9/14/1944	Oil	New Bedford
Marion Dorothy	9/14/1944	Oil	New Bedford
Alice May	1950		New Bedford
Debbie II	8/1954	Gas	New Bedford
Rose Mary Mello	8/31/1954	Oil	New Bedford
Phillip R.	11/15/1954	Barge	New Bedford
Onward	3/17/1956	Oil	New Bedford
Mariner	1956	Yacht	Fairhaven, 1 mile east of West Island
Francis Edward	5/1892		Fairhaven

Shipwrecks listed for the New Bedford/Fairhaven vicinity in *Encyclopedia of American Shipwrecks* (Berman, 1972) include:

Lizzie W. Hannum, a two-masted schooner, wrecked at Great Ledge, Buzzards Bay on April 10, 1895
Marjorie Parker, an oil screw vessel, 76 tons, built in 1923, foundered at Fairhaven on August 31, 1954
Olive M. Williams, an oil screw fishing boat, 50 tons, built in 1928, sank in a storm at Fairhaven on September 1, 1954.
Sally W. Ponder, schooner, 107 tons, built in 1855, foundered at New Bedford on October 9, 1916.
Sankaty, steam screw, 677 tons, built in 1911, burned at New Bedford on June 30, 1924.
Wm A. Grozier, schooner, 116 tons, built in 1865, foundered off New Bedford on July 1, 1913.

Local New Bedford resident, Mr. Gilbert Russell listed by name and type each vessel that was destroyed by the British expedition on September 5, 1778 (in Ricketson, 1858, pg. 75).

Leopard, Ship
Spaniard, Ship
Caesar, Ship
Nanny, Barque
Rosin, Brig
Sally, Fishing Brig
Simeon, Snow
Sally, Continental Brig
Adventure, Schooner
Loyalty, Continental Schooner
Nelly, Sloop
Fly Fish, Sloop
Captain Lawrence, Sloop
Defiance, Schooner
Captain Jenny, Schooner
No Duty on Tea, Brig
Sally, Schooner
Bowers, Sloop
Sally (12 guns), Sloop
Ritchie, Brig
Dove, Brig
Holland, Brig
Joseph R, Sloop
Bociron, Sloop
Pilot Fish, Sloop
The Other Side, Schooner
Sally, Brig
Retaliation, Sloop
J. Brown's, Sloop
Eastward, Schooner

Other documented wrecks in the vicinity include:

Capt. Lavoeiro, 75-foot long New Bedford fishing vessel sank at the State Pier on December 26, 1984, after it struck a barge outside the harbor and returned to the pier where it sank. However, salvagers used a crane and divers to raise it three days later (Quinn, 1988)

3.3 Removal of Derelict Vessels

In 1989, a project was conducted to identify and remove derelict vessels from around the harbor. Parson, Brinckerhoff, Quade, & Douglas, Inc., (Parsons) organized the project that removed 13 derelict boats from New Bedford Harbor, in the municipalities of Fairhaven and New Bedford (Parsons 1989). Seven of those vessels were located in Fairhaven and six were in New Bedford.

One of the derelict vessels, the 85-foot long *Evelina Goulart*, in Fairhaven, was raised on May 25, 1989. She was towed to the Essex Shipbuilding Museum where it was to be restored, near where it was launched in 1927, as one of the last sail-driven fishing schooners.

Other derelict vessels that were removed in 1989 include:

1. a 30-foot wood hull boat (Fairhaven),
2. three construction barges, approximately 60-feet x 20-feet (Fairhaven),
3. a 40-foot fiberglass (Fairhaven),
4. a 20-foot wood vessel (Fairhaven),
5. a barge, approximately 150-feet x 32-feet (New Bedford),
6. a fishing vessel, *Alydar*, approximately 92-feet x 26-feet (New Bedford),
7. a fishing trawler, *Plymouth*, approximately 100-feet x 28 feet (New Bedford),
8. two barges, each approximately 150-feet x 32-feet (New Bedford),
9. a Navy Launch, approximately 150-feet x 32-feet (outside of Hurricane Barrier, New Bedford).

3.4 Potential Submerged Cultural Resource Types

Recorded maritime activity in the New Bedford region dates to the first decade of the seventeenth century. However, it was not until the middle of the eighteenth century that the port of Dartmouth/New Bedford became a prominent fishing harbor. From that era to present, the harbor in the Acushnet River has hosted a consistently high volume of maritime traffic.

Historic documentation confirms that many types of ships and vessels were wrecked in the New Bedford vicinity. A preliminary list of documented vessels wrecked or lost in New Bedford (see Section 3.2) provides an indication of the quantity and types of shipwreck sites that have been deposited on the bottom of the waterway. Drawing from a variety of primary and secondary sources, these lists, while far from comprehensive, give an indication of the wide variety of shipwrecks that have been lost in the waterway over the last 225 years.

Potential shipwreck types in/near New Bedford may include a variety of material dating from Revolutionary War-era through the twentieth century. To discuss the types of vessels potentially present, it is necessary to include vessels from all phases of the commercial and naval activity in this portion of Massachusetts. Wood-hulled ships, ranging from small fishing sloops, shallops, brigs, recreational sailing craft, gas/diesel powered fishing trawlers and coastal schooners, to ship-rigged whalers, have been likely lost near New Bedford. Numerous steamers and ferries also plied the Acushnet River for well over 150 years. Iron-hulled vessels, including paddle wheel and screw steamboats, have been used extensively in the harbor. Indigenous, small rowed- and sailed-vessels were also used throughout all active harbors. Since such a wide range of vessels has been used in New Bedford over such an extended time period, it is almost impossible to feature one particular type of vessel type most likely to be found. Many of these types of vessels would lend historic insights into a wide-range of maritime-related topics and would be considered historically significant.

4.0 PREVIOUS UNDERWATER ARCHEOLOGICAL INVESTIGATIONS

MBUA files contained information on only one previous underwater archeological survey in the project vicinity. Robert Cembrola served as the Principal Investigator for the Marine Archaeological Report that was completed for the New Bedford Phase II Facilities Plan (Cembrola, 1989). Potential submerged cultural resources were identified within a three-mile vicinity of two candidate outfall diffuser sites and within 0.5 miles on either side of the proposed outfall pipeline alignment that extended from the southern tip of New Bedford out 3.5 miles into Buzzards Bay. Two known wrecks sites, the *Margeret Kehoe*, a 62-ton fishing boat sank near Church Rock in 1963, and the *Yankee*, a 6,225 ton, 391-foot steam ship ran aground and sank on Great Ledge on September 23, 1908, were identified in Buzzards Bay, near the mouth of the Acushnet River. The wrecks were outside the area affected by the outfall pipeline and no additional fieldwork was conducted.

5.0 FIELDWORK INVESTIGATION

The remote sensing survey area was divided into three parts: the Outer Harbor (on the outside of the Hurricane Seawall at the entrance to New Bedford Harbor); the Middle Harbor (between the Route 6 bridge and the I-195 bridge); and the Upper Harbor (above the I-195 and Coggshall Street bridges) (Figure 5-1). Water depth varied from 30 feet deep in the outer harbor to areas of less than one foot in sections of the upper harbor. All survey work in the shallow sections of the upper harbor was conducted at or near high tide.

Fieldwork investigations were conducted in the Acushnet River from August 30 – September 11, 1999. The goal of the remote sensing survey was to identify remote sensing targets in the three survey areas and determine if any were suggestive of submerged cultural resources.

5.1 Description of Fieldwork Methodology

John H. Ryther, Jr., managed CR Environmental's field effort and worked closely with the project underwater archeologist, Lee Cox (Dolan Research), and Foster Wheeler geophysicists, Jay Borkland and Richard Funk. CR provided U.S. Coast Guard licensed vessel captain/navigators, Mr. Andrew Spinale or Eric Steele and experienced side-scan sonar/sub-bottom profiler technicians, Mr. Vince Capone or Chris Wright. CR and DR provided all the required equipment for the survey and were familiar with all equipment operations. Foster Wheeler personnel operated the X-Star sub-bottom profiler during survey operation. All CR and Dolan personnel were OSHA health and safety trained and complied with all applicable OSHA and Foster Wheeler Site Specific Safety and Health Plan (SSHP) requirements. All personnel participated in a site orientation and health and safety briefing with Tom Hawthorne, the site Health & Safety officer prior to the survey operation.

Field operations for the remote sensing survey in the outer, middle, and portions of the upper New Bedford Harbor were performed from the 32-foot aluminum survey vessel *Cyprinodon*. This vessel has a large pilothouse for electronics, a five-kilowatt generator, a hydraulic winch, an A-frame for the deployment of equipment, and can accommodate a five or six man survey crew. The vessel is shallow draft, and the mast and A-frame easily fold down permitting access under the I-195 and Coggshall Street Bridges. During the survey operations, the vessel navigated all the required portions of the outer and lower harbor. In the upper harbor, above the Coggshall Street Bridge, the vessel operated at high tide periods in water depths of three to four feet.

On the mud flats in the upper harbor project area, in water depths of one to three feet and in the shallow coves of the middle harbor, a 16-foot aluminum jon boat was utilized to support the survey operation. The vessel accommodated a survey crew of three and was used for side scan sonar, sub-bottom profiling and marine magnetometer surveys in these shallow water areas. The vessel has a 15 horsepower gas outboard and was operated in depths of less than one foot. The vessel was outfitted with a plywood enclosure to house the survey equipment and a Honda generator in the bow. Magnetometer, sonar, and sub-bottom operations were performed at separate times due to space limitations.

A Geometrics, G-881, cesium magnetometer, capable of +/- .001 gamma resolution, was employed to collect magnetic remote sensing data. A 1-second sampling rate by the

magnetometer's towed sensor, coupled with a three to four knot vessel speed, assured a magnetic sample every four to five feet. Sonar data was collected with an Edgetech DF-100 dual frequency towfish with a Digital Control Interface (DCI). The DCI board was installed in a Triton Elics Isis Sonar Data Acquisition and Processing System. Sub-bottom data was also collected with an Edgetech Geo-Star Sub-Bottom Profiler with a SB-216S towfish. Navigation positioning for the survey was accomplished with a Trimble Pathfinder Pro XL Global Positioning System with the Pro Beacon providing differential corrections. Line spacing for the entire project was maintained at 50-foot offsets.

Horizontal positioning for the survey was accomplished with a Trimble Pathfinder Pro XR Global Positioning System with the Pro Beacon (DGPS). With this system, differential corrections were obtained from the Coast Guard Beacons and sub-meter accuracy was achieved. The NEMA data output from the Trimble GPS was output to a NEMA splitter box and navigation strings were furnished to the side-scan sonar, sub-bottom profiler, and HYPACK navigation software.

5.2 Analysis of Remote Sensing Data

Analysis of remote sensing signatures identified during the survey was based on several criteria. Magnetometer data were contour plotted and each anomaly was analyzed according to: magnetic intensity (total distortion of the magnetic background measured in gammas); pulse duration (detectable signature duration); signature characteristics (negative monopolar, positive monopolar, dipolar, or multi-component); and spatial extent (total area of disturbance). Acoustic targets were analyzed according to their spatial extent (total area of disturbance), signature characteristics (shape, relief above the bottom, strength of return and contrast with the background) and environmental context. Seismic (sub-bottom) data were collected primarily for the geophysical survey of the project areas (FWENC 2001). Analysis of this data was useful in mapping the depth of bedrock. Dolan Research did not identify any potential shipwreck sites or other submerged cultural resources during the analysis of the seismic data.

Criteria for analyzing remote sensing targets have been developed from a database of target signatures that have been compiled over the last three decades. Starting in the 1960s, archaeologists primarily relied on magnetic remote sensing data, collected with proton procession magnetometers, to locate submerged cultural resources. However, magnetic data collected alone often provides inconclusive evidence on submerged cultural resource sites. Underwater archeological research conducted over the last two decades indicates that shipwreck sites may produce a variety of magnetic signatures. Furthermore, modern debris often generates magnetic signatures that may share similar characteristics with certain types of shipwreck sites.

The ambiguous nature of magnetic signatures has led researchers to use acoustic and occasionally sub-bottom remote sensing equipment in conjunction with a magnetometer on most underwater archeological surveys. Side-scan sonar units gather acoustic data by processing sound waves emitted into the water column on both sides of the submerged sensor. The sound waves are then bounced back off the bottom surface and exposed objects. State of the art digital sonar units produce high-resolution records that are almost photographic in quality. However, a certain degree of structural integrity of a shipwreck site must remain above the bottom to produce a reliable shipwreck signature on side scan sonar. Where no structure survives above the bottom surface, researchers must rely on magnetic data to help locate shipwreck remains. Additional data provided by acoustic instruments frequently permits target identification to be made solely

from remote sensing information. A combination of magnetic and acoustic remote sensing data has proven to be the most effective method to accurately identify and assess submerged archeological sites. Typically, the most attractive targets produce both a defined magnetic and acoustic signature.

In preparing the technical report, remote sensing targets were characterized according to potential significance. Target locations that generated signature characteristics suggestive of submerged cultural resources were designated as High Probability Targets. All other targets, including single source objects and modern debris, were simply listed as targets. Additional underwater archeological investigations were recommended at the former type of targets.

5.3 Findings of Remote Sensing Survey

Targets have been listed according to the survey area where they were found (Outer Harbor, Middle Harbor, and Upper Harbor). Each target has been designated with a number that was derived from the lane number where the signature was most intense, followed by a colon and the corresponding event number along that survey lane. Types of targets refer to magnetic (m) targets, sonar (s) targets; and combined (m/s) magnetic targets with an associated sonar image. Also included in the target list are the position coordinates for each target, expressed in Massachusetts State Plane Coordinate System (NAD83) and target characteristics and comments.

Magnetic samples were collected at one-second intervals. Boat speed during the survey did not exceed four knots, assuring a magnetic sample every four to five feet. The two-channel 500 kHz side scan sonar sensor had an effective range of 150 feet in either channel. Lane spacing for the survey was established at 50-foot offsets.

Sixty (60) remote sensing targets were identified during the survey. Of that number, 10 targets were found in the Outer Harbor, 27 targets in Middle Harbor, and 23 targets in Upper Harbor. Two targets, both in the Middle Harbor Area, generated remote sensing signatures that are suggestive of submerged cultural resources. Additional underwater archeological investigation is recommended at these locations.

The remaining targets were identified as an assortment of modern debris objects, shore related noise, and sections of pipe or pieces of wire rope. Many other sources of magnetic and acoustic anomalies were not classified as target sites. These objects and features include: barges, power lines, rocks and rock outcroppings, outfall pipes, power transmission lines, submerged pipelines, wharves, moored fishing vessels and sailboats, and iron bulkheads. However, many of these features and other assorted objects *were* designated as targets during a separate review of project data conducted by Foster Wheeler Environmental Corporation geophysicists. A list of these magnetic and acoustic contacts is presented in FWENC (2001). Dolan Research has reviewed these lists and associated data and concluded they contain no additional targets that could represent potentially significant submerged cultural resources.

At the two potentially significant target locations, a Phase II underwater archeological investigation with divers is recommended if the Project will affect the targets. The goal of the diver investigations will be to identify the nature of the material/object that generated the remote sensing signature and to determine if the site has potential to satisfy the National Register of Historic Places eligibility criteria. No further underwater archeological investigation is recommended for the other targets.

5.3.1 Outer Harbor Project Area

Survey work at the Outer Harbor project area was conducted on August 30 & 31, 1999. Large-scale magnetic variations were recorded across much of the Outer Harbor survey area. The background magnetic changes were likely related to geological features, such as rock outcrops, that were present on both shorelines. Sonar records indicate the presence of numerous large rocks in the cove next to the west end of the Hurricane barrier. Due to the presence of these large rock formations in shallow water, no survey lanes were completed next to the New Bedford Harbor hurricane barrier (Figure 5-2). It appears that much of Outer Harbor project area had a hard bottom, making it unlikely that historical material would have survived intact in the high-energy environment present at the mouth of the Acushnet River. Ten magnetic targets were identified during the survey (Figure 5-3). However, target signatures at each site lacked duration and intensity, indicating single-source, isolated objects. None of the ten targets (Table 5-1) were considered to be suggestive of submerged cultural resources. A side scan sonar mosaic plan of the outer harbor project area was also generated (Figure 5-4). No targets of potential significance were identified. No additional underwater archeological investigation is recommended.

5.3.2 Middle Harbor Project Area

Survey work at the Middle Harbor project area was conducted on September 1–3, 1999 (Figure 5-5). In the Middle Harbor survey area, magnetic noise was generated by multiple factors (Figure 5-6). These include; metal bulkheading along much of New Bedford's waterfront and Pope Island, the Fairhaven bridge, steel-hulled fishing boats tied up to wharves at New Bedford and Pope Island, several large moored barges and tugs, moored sailboats, submerged pipeline crossings, and the presence of a fleet of derelict vessels abandoned adjacent to the New Bedford waterfront at the proposed location of CDF D. These sites were not considered remote sensing targets. Buried submerged cultural resources may exist in these areas, but their presence would be masked by the large-scale magnetic disturbances generated by those objects.

Twenty-seven remote sensing targets were identified in the Middle Harbor project area (Table 5-2). All but two of those were dismissed as modern, noise- or debris-related. Two of the magnetic targets generated remote sensing signatures with extended duration and significant ferrous mass to be considered suggestive of submerged cultural resources.

The two magnetic targets of potential significance were designated 27:196 & 66:161. They are shaded in Table 5-2. If this target will be affected by the Project, underwater archeological investigation is recommended to identify the material/object(s) that were responsible for generating the remote sensing signature. Once the target source has been identified, researchers will evaluate each site's potential historical significance according to National Register criteria.

A side scan sonar mosaic plan of the middle harbor project area was generated (Figure 5-7). While no potential historically significant shipwreck sites were found on the side scan data, inspection of the acoustic data confirmed the presence of a short section of railroad tracks close to the New Bedford shoreline (Figure 5-8). This site was designated Target 24:693. The presence of the structure appears to corroborate anecdotal evidence from town records and rumors from long-time residents that a section of railway track that once spanned the river south of the Coggshall Street Bridge – and was destroyed by a mid-century hurricane – may have been left in the harbor. Sonar records also indicate the presence of several pipeline crossings under the

Acushnet River. Very shallow water along the Fairhaven side of the harbor, north of the cove with the moored pleasure boats, required the use of a small 16-foot aluminum jon boat to complete remote sensing survey coverage.

5.3.3 Upper Harbor Project Area

Magnetic survey work at the Upper Harbor project area was conducted on September 4 and 11, 1999. (Figure 5-11). Limited sonar data were collected on September 3, 1999. All survey work was conducted from the 16-foot jon boat.

Twenty-three magnetic targets were identified during the survey (Figure 5-9)(Table 5-3). However, none of the targets generated signatures that are typically associated with submerged cultural resources. Large magnetic anomalies were identified adjacent to CDF A. (39:609 and 52:141) and CDF B (39:235, 41:444, and 41:348). However, the intensity of the target signatures suggest the target sources are related to modern debris or shoreline-related noise. In the northern end of the Upper Harbor project area, several power lines crossed the Acushnet River and generated large linear magnetic disturbances. Numerous shoreline-related magnetic anomalies were recorded along the western shoreline of the river, particularly adjacent to CDF C.

Much of the Upper Harbor survey area had shallow water conditions that limited the collection of sonar data. Sonar equipment was only deployed in areas that had a minimum six-foot depth. A side scan sonar mosaic plan of the upper harbor project area was also generated (Figure 5-13). However, no targets of potential significance were identified.

5.3.4 Derelict Vessels in Former Shipyard Adjacent to CDF D

A fleet of derelict vessels has been abandoned along a portion of the New Bedford waterfront known as the Melville Shipyard (Plate 1). The collection of fishing boats, tugs, and barges survive in varying states of disrepair. Additional information on the origin of the abandoned boats was obtained from correspondence with Chip Ryther (CR Environment); and Marty Manly (harbormaster at the Pope Island Marina).

The following boats and boat types have been identified in the shipyard:

Five "eastern rig" wooden-hull scalloper fishing vessels. All appear to date to ca. 1950. They are approximately 60- to 70-feet long. At least three of them are partially submerged; including the *Commonwealth* (Plates 2 and 3), *Geraldine*, and *Alcha*.

Other fishing vessels include the *Neisha Ann*, (a fiberglass boat, approximately 40-feet long); *Green Acres* (a modern western rig fishing boat); a second unidentified western rig fishing boat; (Plate 4). and *Jeroni*, (a 50-foot gill netter fishing boat).

Two partially submerged barges; one was outfitted with what appears to be a fish processing plant (Plate 5).

A small coastal tug, (ca. 1930, approximately 70-feet long); and an unidentified larger tug.

An aluminum boat, approximately 45-feet long, on the shore under a shed.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Historic sources confirm a sustained level of maritime activity in New Bedford harbor since the middle of the eighteenth century. Dozens of vessels were documented as having been stranded, foundered, burned, capsized and destroyed in the New Bedford vicinity. Secondary sources have listed numerous wrecks in the project vicinity. Many of these vessels, including a number of Revolutionary War wrecks, were lost in the section of the harbor between the Route 6 bridge and the Hurricane Wall – outside the limits of this project. In addition, large portions of the harbor have been dredged during navigational improvements and many potential submerged sites were likely removed long ago as hazards to navigation. Since New Bedford is still a very busy commercial port, it is unlikely that potentially significant submerged cultural resources have been deposited within New Bedford harbor and have remained undetected and unknown. Local residents and watermen familiar with the harbor were unaware of any potential wreck sites within the harbor. Nonetheless, the harbor potentially contains cultural material from each phase of the port's extensive maritime history.

In an effort to identify submerged cultural resources that may be affected by the dredging of the Acushnet River and New Bedford Harbor, a comprehensive Phase I remote sensing survey was conducted across three project areas: Outer Harbor, Middle Harbor, and Upper Harbor. Magnetic and acoustic remote sensing records were processed and correlated to determine the presence of targets that possessed signature characteristics suggestive of submerged cultural resources. Although analysis of the remote sensing data identified 60 magnetic and/or acoustic targets in the three project areas, only two remote sensing targets (27:196 & 66:161) were considered to be significant targets. Both of the targets were located in the Middle Harbor project area. Both targets generated magnetic signature characteristics suggestive of submerged cultural resources and were designated as High Probability Targets where additional archeological investigation or avoidance, if possible, should be considered.

Avoidance of the two specified target locations during dredging activities should be given consideration. If site avoidance is not a viable option, additional archeological investigation at these targets is recommended to determine the nature of the object(s) responsible for generating the remote sensing signatures. The goal of the ground truthing of these targets would be to determine National Register-eligibility status of the submerged sites. After the object(s) have been identified and documented, field data would be correlated with background historical information. Each site's historical context and the field data documenting their respective integrity, qualities, associations, and characteristics, would be used to confirm National Register eligibility requirements. The National Register criteria could then be applied to provide recommendations pertaining to the eligibility or ineligibility of each of the sites. Sites with the potential for inclusion in the National Register, would then become the focus of a more detailed archeological investigation.

A fleet of derelict vessels has been abandoned adjacent to New Bedford waterfront in the Middle Harbor project area. Eastern rig- and western rig-fishing boats, tugboats, and barges comprise the cluster of half submerged boats that are located in an area that has become known as the Melville shipyard. The location of the shipwreck cluster is within the boundaries of CDF D. While the majority of the vessels have little or no historical value, one of the tugboats and one or more of the eastern-rigged fishing vessels may have historical significance. Additional documentary research about the vessels and vessel-types, and a complete photographic documentation of those two sites, is recommended. This information is necessary to determine if either site satisfies

National Register eligibility criteria. Appropriate vessels should be documented on inventory forms as per the BUAR in order to document National Register eligibility.

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TABLES

Table 5-1. Remote-sensing targets identified in the Outer Harbor portion of the project area.

Target #	Type	Coordinates (Mass NAD 83)	Comments:
17:375	M	E 818,663 N 2,687,563	99 gamma positive, monopolar signature; 9 sample intervals, near boat channel, appears to be an isolated object
25:317	M	E 818,663 N 2,687,563	56 gamma negative, monopolar signature; 7 sample intervals, small, isolated object
34:125	M	E 818,818 N 2,687,087	70 gamma positive, monopolar signature; 6 sample intervals, isolated object
39:110	M	E 818,412 N 2,686,308	61 gamma positive, monopolar signature; 8 sample intervals, also detected in lane 40, likely associated with debris
42:154	M	E 818,791 N 2,686,512	98 gamma positive, monopolar signature; 6 sample intervals
42:198	M	E 818,562 N 2,686,242	80 gamma negative, monopolar signature; 5 sample intervals, small isolated object
48: 59	M	E 818,638 N 2,685,988	47 gamma positive, monopolar signature; 5 sample intervals, very small , isolated object
49:42	M	E 818,466 N 2,685,763	125 gamma dipolar signature; 6 sample intervals, isolated object
52:162	M	E 819,256 N 2,686,309	126 gamma dipolar signature; 7 sample intervals, isolated object
54: 32	M	E 819,560 N 2,686,495	77 gamma negative, monopolar signature; 12 sample intervals, broad, likely associated with a boat turn

Table 5-2. Remote-sensing targets identified in the Middle Harbor portion of the project area.

Target #	Type	Coordinates (Mass NAD 83)	Comments:
16:61	S	E 814,446 N 2,697,277	linear hard object that becomes buried in bottom, possible pipeline
24:241	S	E 814,450 N 2,695,582	isolated rectangular object lying flat on the bottom, located near bulkhead
24:693	S	E 814,602 N 2,698,873	A 55-foot section of railway track is lying flat on the bottom next to a large rock pile (Figure 5-8). The rails do no appear to be from a marine railway, but rather may be debris from a former railway bridge that crossed the river south of the Coggshall Street Bridge. That bridge was destroyed by a hurricane in the middle of the twentieth century.
25:535	M	E 814,617 N 2,697,643	144 gamma negative, monopolar signature; 5 sample intervals, small, isolated object
26:390	S	E 814,596 N 2,696,787	three small hard objects, one may be a mooring anchor; also identified during lane 30 @ event #339
24:689	S	E 814,487 N 2,694,892	small hard object located 35 meters out in left channel, target location is in the middle of the channel and is considered to be modern debris
27:196	**M**	**E 814,617 N 2,697,643**	**515 gamma dipolar signature; 12 sample intervals, large, buried target; evidence of the broad target signature was found in several lanes; if this target will be affected by the Project, underwater archeological investigation is recommended**
31:30	M	E 814,886 N 2,698,320	50 gamma positive, monopolar signature; 5 sample intervals, small, isolated object
33:143	S	E 814,785 N 2,695,438	isolated circular object lying flat on the bottom, located in the middle of the channel and is considered to be modern debris
33:721	S	E 814,984 N 2,699,107	small, hard rectangular object, lying flat on the bottom, possibly associated with object at 33:736, modern debris
33:736	S	E 814,986 N 2,699,198	small, hard rectangular object, lying flat on the bottom' possibly associated with object at 33:721, modern debris
37:372	M	E 815,042 N 2,696,680	248 gamma positive, monopolar signature; 4 sample intervals, small, isolated object
42:482	M/S	E 815,279 N 2,697,639	128 gamma positive, monopolar signature; 11 sample intervals, noisy associated targets found in 2 nearby lanes, likely associated with a pipeline crossing – see targets 45:123 & 47:421
45:123	M	E 815,273 N 2,697,267	152 gamma dipolar signature; 9 sample intervals, noisy associated targets found in 3 nearby lanes, likely associated with a pipeline crossing – see targets 42:482 & 47:421
47:421	M	E 815,385 N 2,697,936	286 gamma positive, monopolar signature; 6 sample intervals, noisy associated targets found in 2 nearby lanes, likely associated with a pipeline crossing – see targets 45:123 & 42:482
49:229	M	E 815,326 N 2,696,352	14 gamma dipolar signature; 6 sample intervals, small, isolated object
51:167	S	E 815,821 N 2,695,457	small wreck-like image; possibly a small boat that was abandoned near marina, all indications point to a modern boat
66:161	M	E 815,602 N 2,696,988	282 gamma positive, monopolar signature; 14 sample intervals, although near a mooring buoy this signature appears to have a separate, extended duration component; if this target will be affected by the Project, underwater archeological investigation is recommended
72:269	M	E 815,657 N 2,696,095	48 gamma dipolar signature; 10 sample intervals, 8 feet deep, small, isolated object

80:147	M	E 815,895 N 2,696,676	117 gamma negative, monopolar signature; 12 sample intervals, next to moored sailing boat, likely associated with mooring anchor and/or boat
84:136	M	E 815,983 N 2,696,144	554 gamma multi-component signature; 5 sample intervals, noise-related target signature with 2 positive spikes
84:199	M	E 815,959 N 2,695,740	55 gamma positive, monopolar signature; 5 sample intervals, small, isolated
87:66	M	E 816,072 N 2,695,956	46 gamma negative, monopolar signature; 6 sample intervals, small, isolated
88:60	M	E 816,125 N 2,695,664	114 gamma negative, monopolar signature; 9 sample intervals, noisy, possibly related to shoreline debris
92:20	M	E 816,392 N 2,697,562	59 gamma negative, monopolar signature; 6 sample intervals, small, isolated object
94:103	M	E 816,419 N 2,696,973	653 gamma dipolar signature; 18 sample intervals, associated with shoreline noise, located in very shallow water
94:170	M	E 816,419 N 2,696,973	194 gamma multi-component signature; 6 sample intervals, associated with shoreline noise, very shallow water

Table 5-3. Remote-sensing targets identified in the Upper Harbor portion of the project area.

Target #	Type	Coordinates (Mass NAD 83)	Comments:
14:28	M	E 814,626 N 2,702,290	243 gamma positive, monopolar signature; 5 sample intervals, small, and located in very shallow water in cove above CDF C
14:42	M	E 814,631 N 2,702,218	126 gamma negative, monopolar signature; 4 sample intervals, small and located in very shallow water in cove above CDF C
32:132	M	E 815,032 N 2,701,438	846 gamma negative, monopolar signature; 4 sample intervals, intense, no duration, likely related to object(s) associated with CDF C
32:147	M	E 815,033 N 2,701,311	230 gamma negative, monopolar signature; 3 sample intervals, intense, no duration, likely related to object(s) associated with CDF C
33:184	M	E 815,096 N 2,701,741	40 gamma positive, monopolar signature; 4 sample intervals, small, isolated object
34:117	M	E 815,097 N 2,701,199	448 gamma dipolar signature; 12 sample intervals, intense, noisy target likely related to object(s) associated with CDF C
34:56	M/S	E 815,098 N 2,700,745	695 gamma positive, dipolar signature; 12 sample intervals, rockpile/pipeline site extending from shoreline
36:119	M	E 815,134 N 2,701,547	279 gamma negative, monopolar signature; 4 sample intervals, intense, no duration, isolated object
39:150	M	E 815,209 N 2,702,975	113 gamma dipolar signature; 7 sample intervals, intense, limited duration, related to shoreline object(s)
39:235	M	E 815,183 N 2,703,733	136 gamma dipolar, monopolar signature; 8 sample intervals, intense, related to shoreline object(s), possibly a pipe; likely associated with target 41:444
39:607	M	E 815,029 N 2,705,557	60 gamma dipolar signature; 6 sample intervals, small, limited duration signature, related to shoreline object(s)
40:248	M	E 815,253 N 2,702,746	297 gamma negative, monopolar signature; 10 sample intervals, intense, likely associated with shoreline object(s)
41:348	M	E 814,981 N 2,704,675	680 gamma dipolar signature; 10 sample intervals, very intense, related to shoreline object(s), suggestive of a pipe
41:444	M	E 815,057 N 2,703,922	584 gamma negative, monopolar signature; 12 sample intervals, very intense, related to shoreline object(s), suggestive of a pipe; likely associated with target 39:235
45:229	M	E 815,498 N 2,702,146	149 gamma dipolar signature; 6 sample intervals, small isolated object
46:425	M	E 815,532 N 2,702,386	246 gamma dipolar signature; 6 sample intervals, small, isolated object
48:401	M	E 815,627 N 2,701,017	99 gamma noisy dipolar signature; 12 sample intervals, noise spikes typically associated with modern debris
52:141	M	E 815,667 N 2,706,454	85 gamma positive, monopolar signature; 4 sample intervals, may be associated with submerged object crossing the river; possible association with target 59:148 and 63:73; target location is adjacent to CDF A
54: 32	M	E 819,560 N 2,686,495	77 gamma negative, monopolar signature; 12 sample intervals, broad, however, it is likely associated with a boat turn
55:171	M	E 815,747 N 2,707,133	405 gamma multi-component signature; 14 sample intervals, intense signature likely related to shoreline debris
59:148	M	E 815,836 N 2,706,395	107 gamma dipolar signature; 7 sample intervals, may be associated with submerged object crossing the river; possible association with target 52:141 and 63:73; target location is adjacent to CDF A

63:73	M	E 815,901 N 2,706,438	250 gamma positive, monopolar signature; 8 sample intervals, may be associated with submerged object crossing the river; possible association with target 52:141 and 59:148; target location is adjacent to CDF A
73:129	M	E 816,030 N 2,706,611	60 gamma negative, monopolar signature; 4 sample intervals, small, isolated signature likely related to shoreline debris

FIGURES

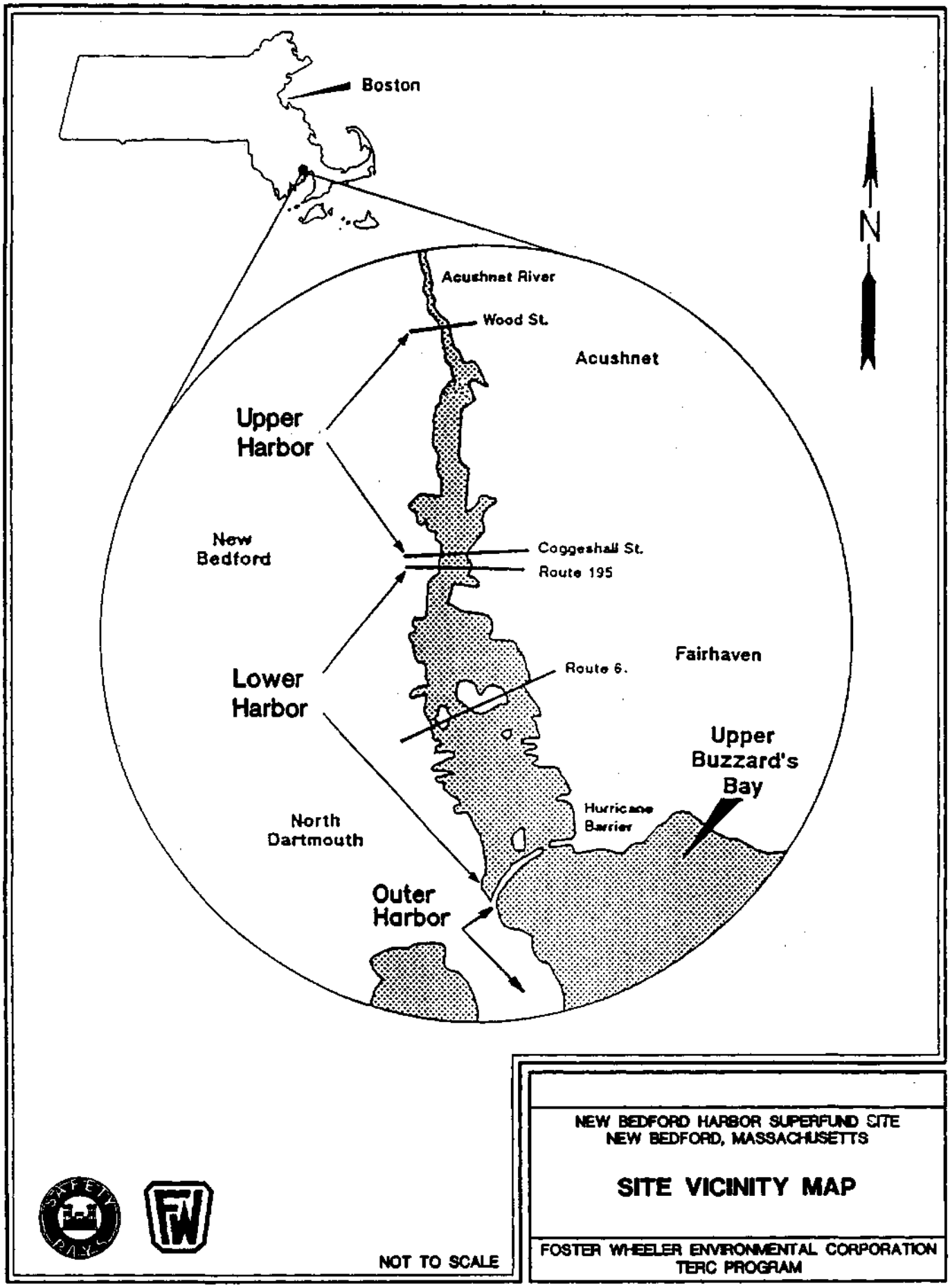


Figure 1-1. Site Vicinity Map.

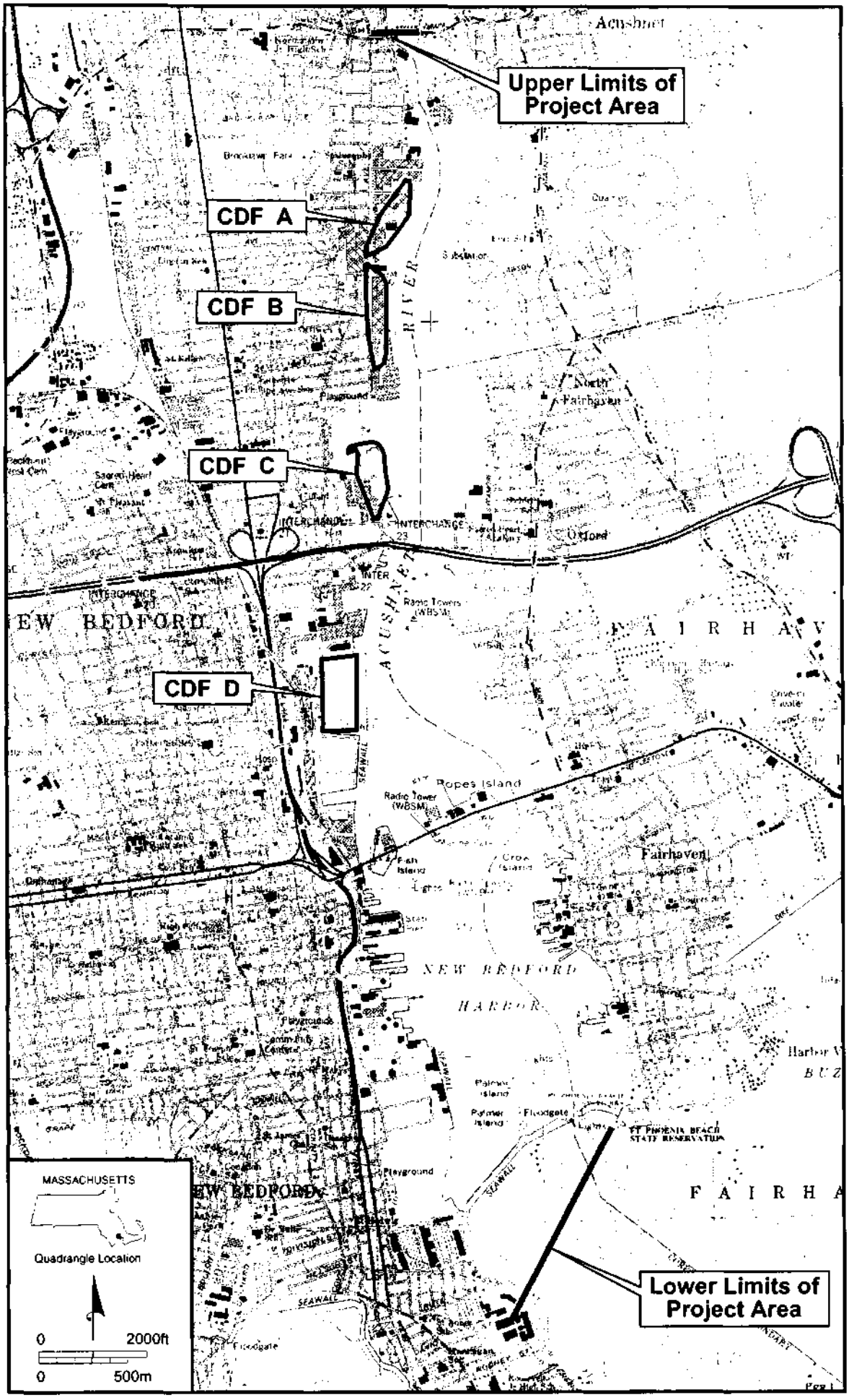
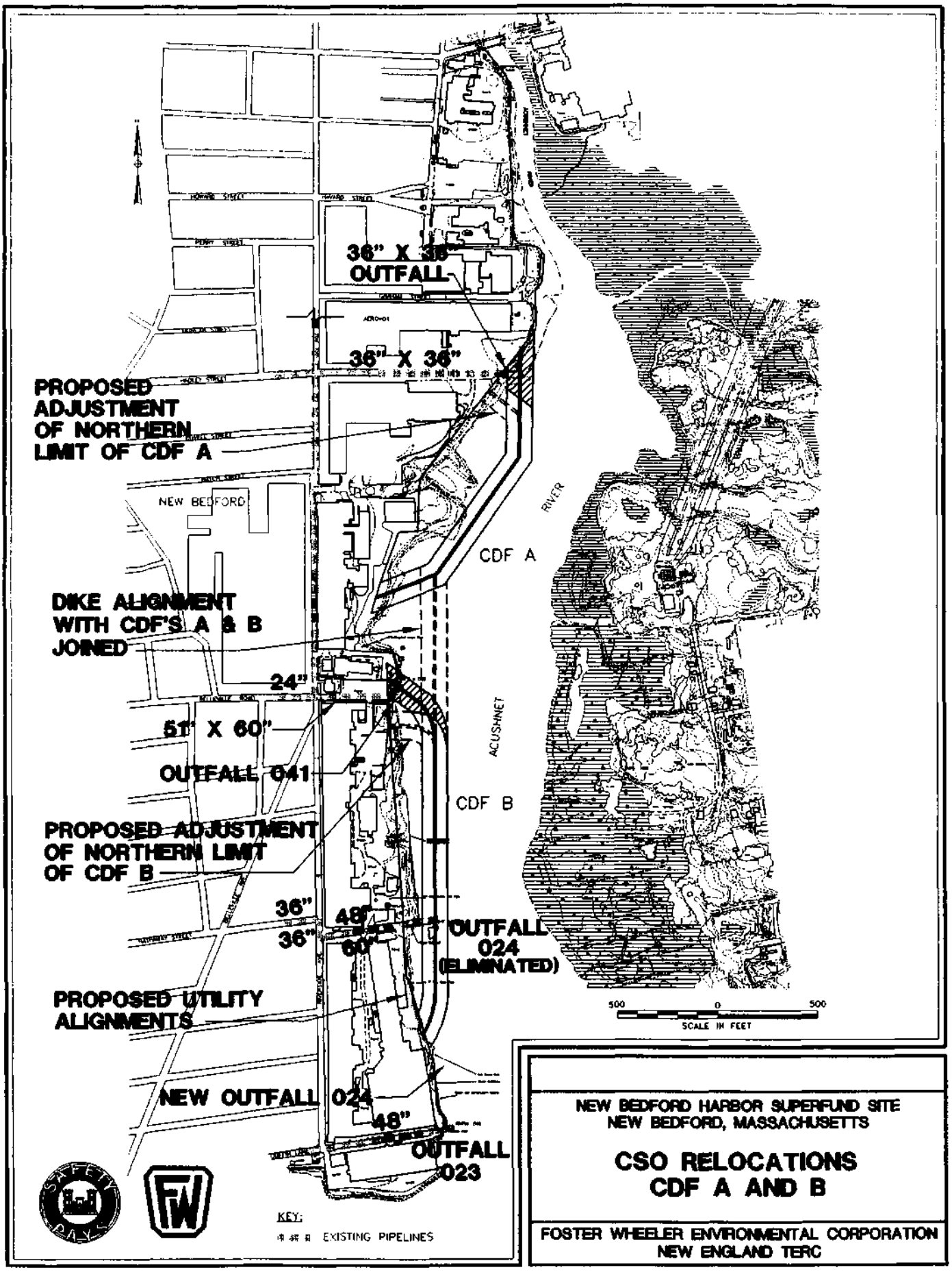


Figure 1-2. Locations of Proposed CDFs and Limits of Proposed Dredging.



CADDFILE: 5197NB06.DWG

Figure 1-3. CSO Relocations, CDF A and B.

Originals in color.

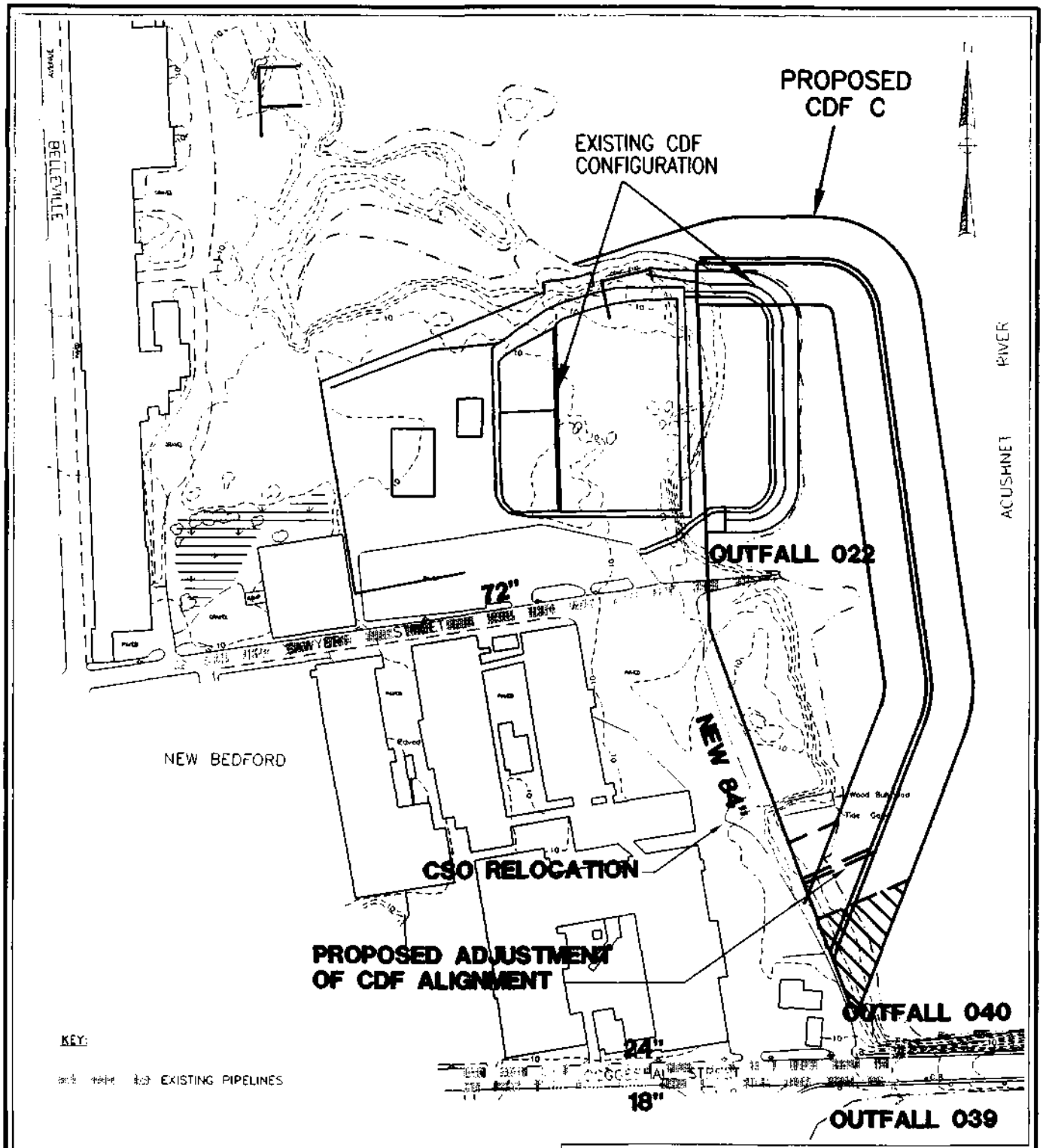


Figure 1-4. CSO Relocation, CDF C.

Originals in color.

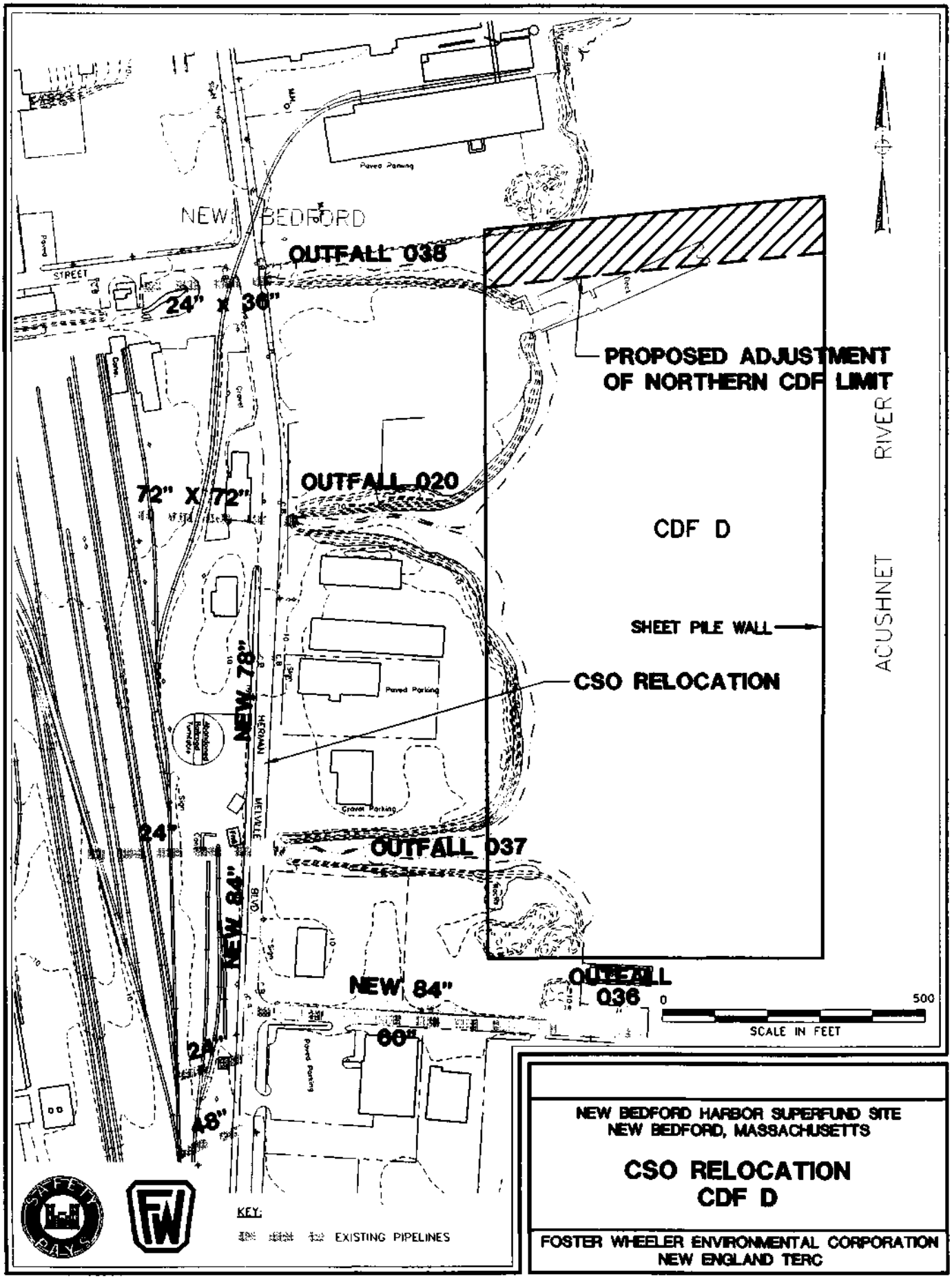
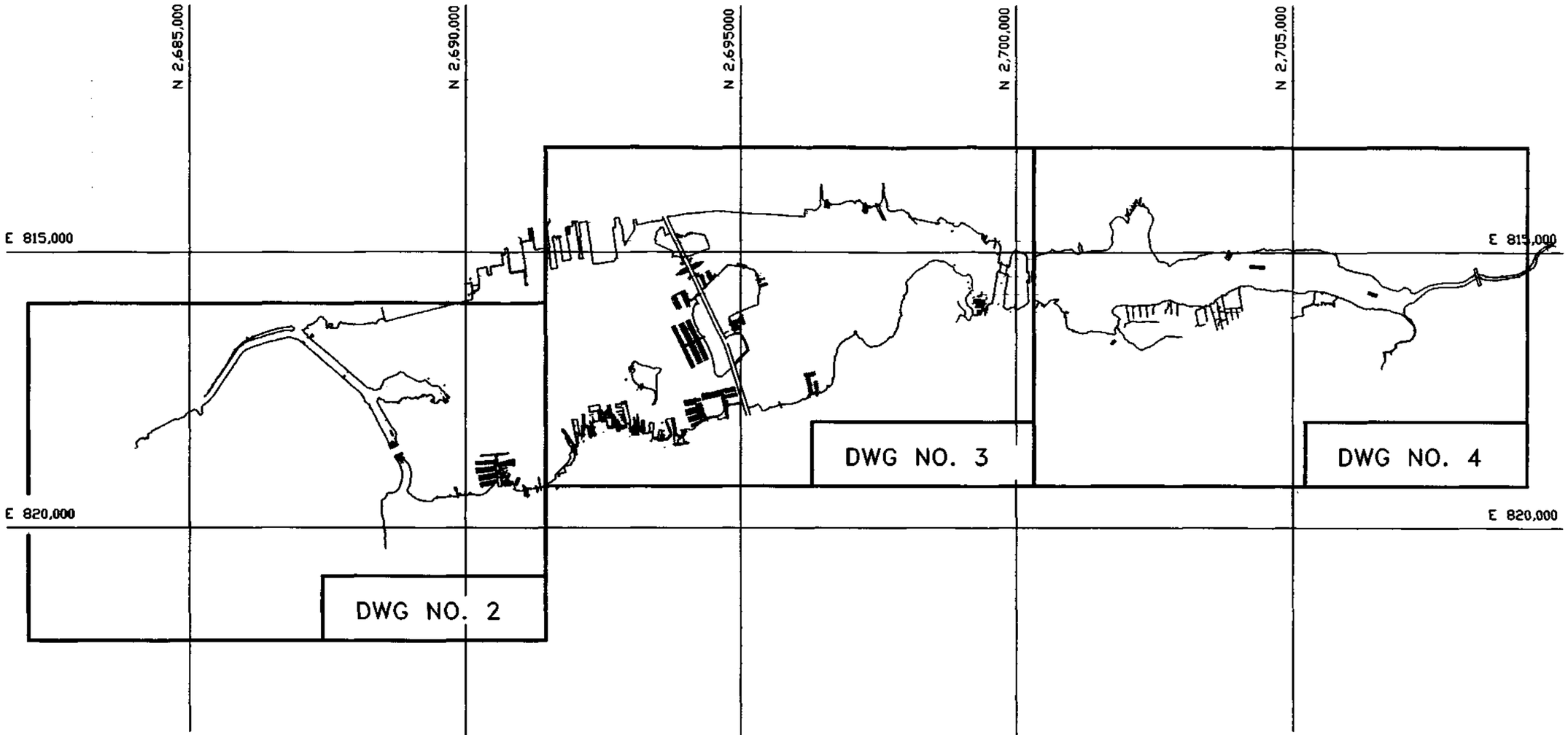


Figure 1-5. CSO Relocation, CDF D.

Originals in color.



NOTES:

1. HORIZONTAL CONTROL PROVIDED BY FOSTER WHEELER, INC., MASSACHUSETTS MAINLAND TRAVERSE MECATOR PROJECTION – NAD 83 – ZONE 2001 – INDICATED IN FEET

2. BACKGROUND INFORMATION PROVIDED BY FOSTER WHEELER, INC.

LOCATION MAP

SCALE IN FEET

2000 0 2000

1000

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NEW BEDFORD, MA

Figure 5-1. Location Map.

DWG. NO. 1

NOTES:

1. HORIZONTAL CONTROL PROVIDED BY FOSTER WHEELER, INC., MASSACHUSETTS MAINLAND TRAVERSE MECATOR PROJECTION – NAD 83 – ZONE 2001 – INDICATED IN FEET

2. BACKGROUND INFORMATION PROVIDED BY FOSTER WHEELER, INC.

3. SURVEY CONDUCTED ON: 08/31 & 09/01/99.

TRACK PLOT

SCALE IN FEET

600 0 600

300

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Figure 5-2. Outer Harbor Area–Track Plot.

DWG. NO. 2

N 2,684,000
N 2,686,000
N 2,688,000
N 2,690,000
E 818,000
E 820,000
APPROXIMATE SHORELINE
39:110
25:317
34:125
17:375
49:42
48:59
42:198
52:162
54:32
42:154
153
160
178

NOTES:

1. HORIZONTAL CONTROL PROVIDED BY FOSTER WHEELER, INC., MASSACHUSETTS MAINLAND TRAVERSE MECATOR PROJECTION – NAD 83 – ZONE 2001 – INDICATED IN FEET

2. BACKGROUND INFORMATION PROVIDED BY FOSTER WHEELER, INC.

3. SURVEY CONDUCTED ON: 08/30 & 08/31/99.

4. MAGNETIC TARGET

MAGNETIC CONTOUR AND TARGET MAP

SCALE IN FEET

600 0 600

300

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NEW BEDFORD HARBOR, ACUSHNET RIVER
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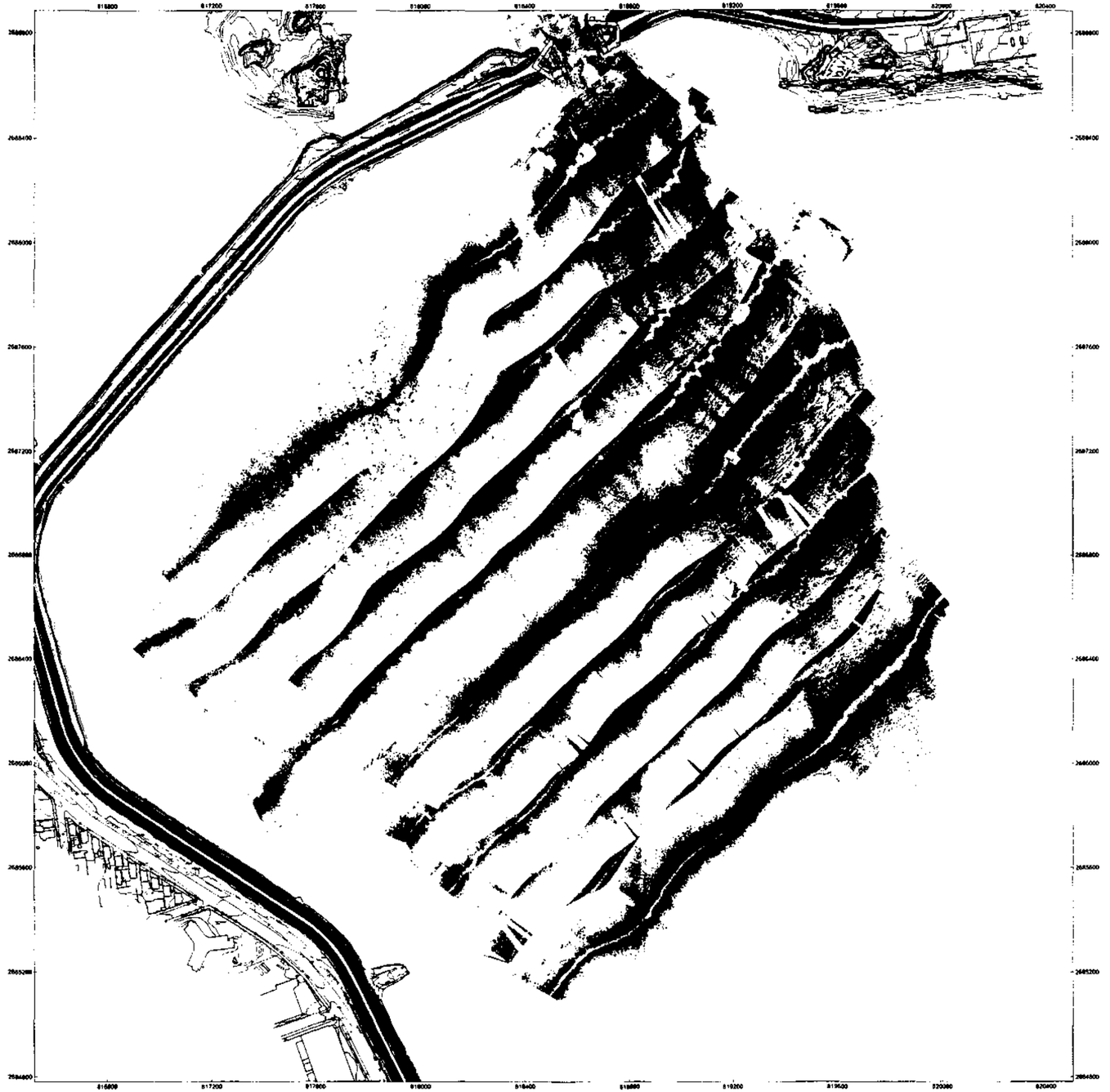
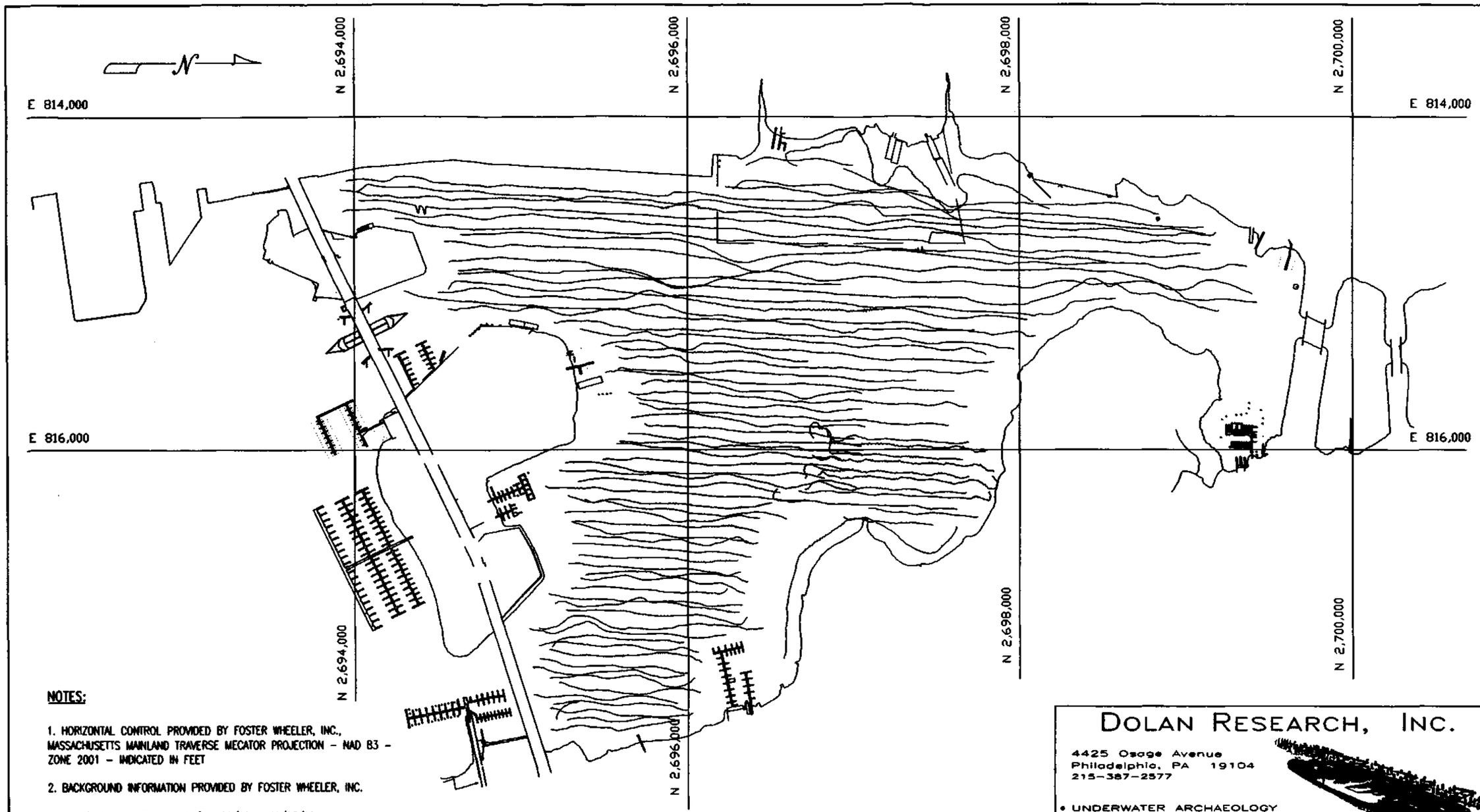
Figure 5-3. Outer Harbor Area–Magnetic Contour and Target Map.

DWG. NO. 3



Originals in color.



NOTES:

1. HORIZONTAL CONTROL PROVIDED BY FOSTER WHEELER, INC., MASSACHUSETTS MAINLAND TRAVERSE MECATOR PROJECTION – NAD 83 – ZONE 2001 – INDICATED IN FEET

2. BACKGROUND INFORMATION PROVIDED BY FOSTER WHEELER, INC.

3. SURVEY CONDUCTED ON: 09/01, 09/02 & 09/03/99.

TRACK PLOT

SCALE IN FEET

600 0 600

300

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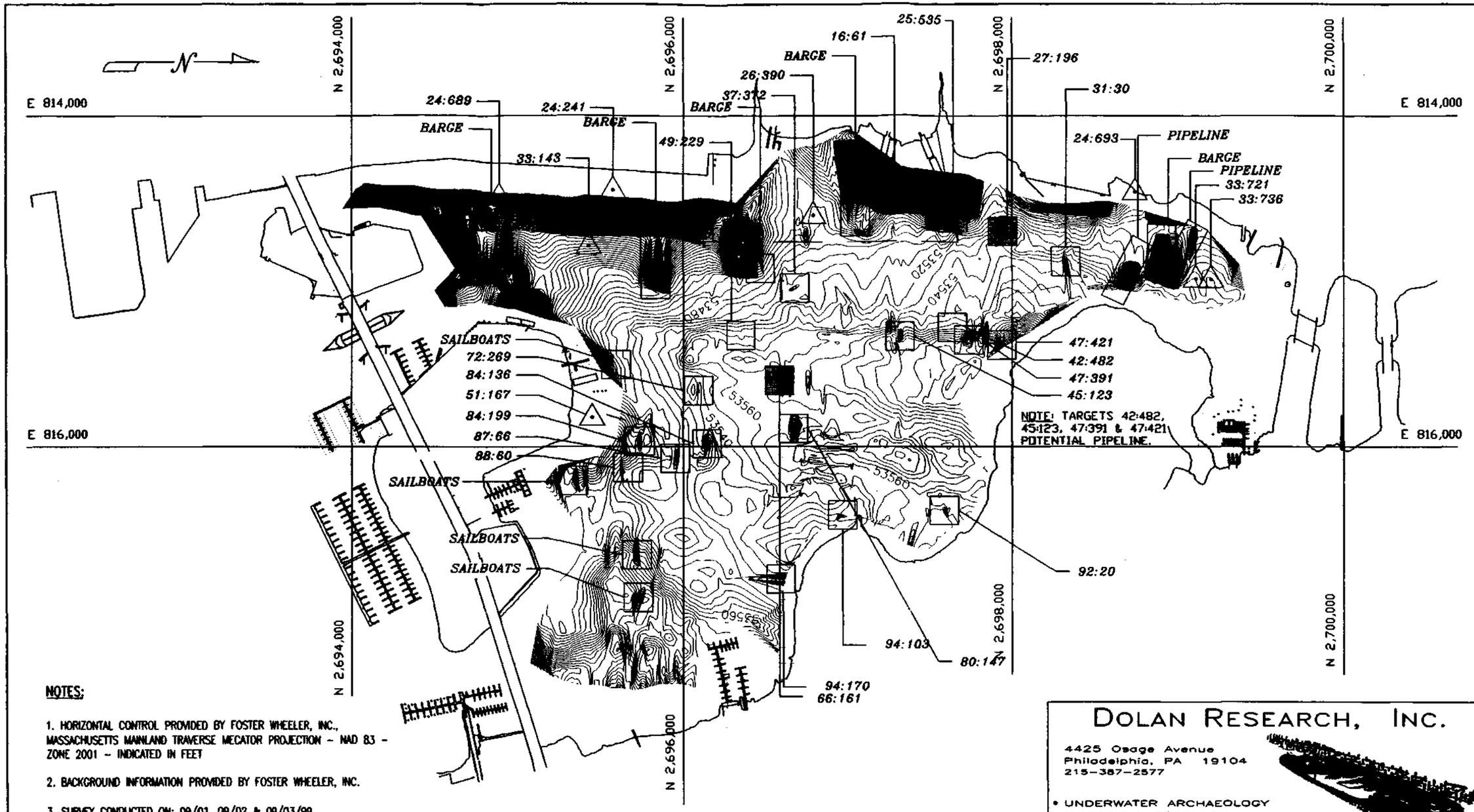
NEW BEDFORD HARBOR, ACUSHNET RIVER
NEW BEDFORD, MA

Figure 5-5. Middle Harbor Area–Track Plot.

DWG. NO. 4



NOTES:

1. HORIZONTAL CONTROL PROVIDED BY FOSTER WHEELER, INC., MASSACHUSETTS MAINLAND TRAVERSE MECATOR PROJECTION – NAD 83 – ZONE 2001 – INDICATED IN FEET
2. BACKGROUND INFORMATION PROVIDED BY FOSTER WHEELER, INC.
3. SURVEY CONDUCTED ON: 09/01, 09/02 & 09/03/99.
4. MAGNETIC TARGET
5. HIGH PROBABILITY TARGET
6. SONAR TARGET

MAGNETIC CONTOUR AND TARGET MAP

SCALE IN FEET

600 0 600

300

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Figure 5-6. Middle Harbor Area–Magnetic Contour and Target Map.

DWG. NO. 5

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US Army Corps of Engineers New England District

FIGURE 5-7

New Bedford Harbor Superfund Site
New Bedford, Massachusetts
MIDDLE HARBOR AREA OF INTEREST

SIDE SCAN SONAR MOSAIC PLAN MAP

FWENC Geophysics

Originals in color.

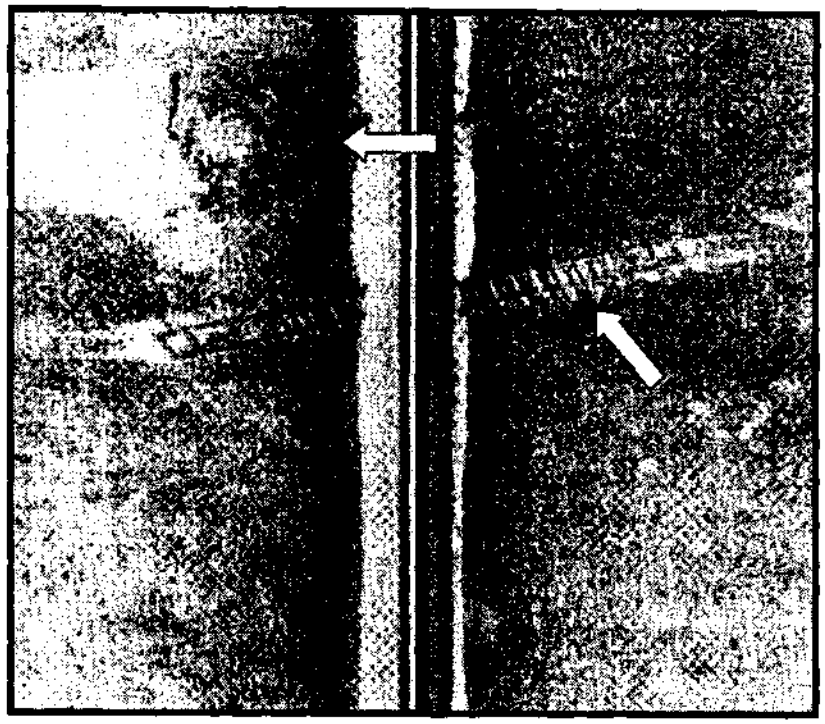
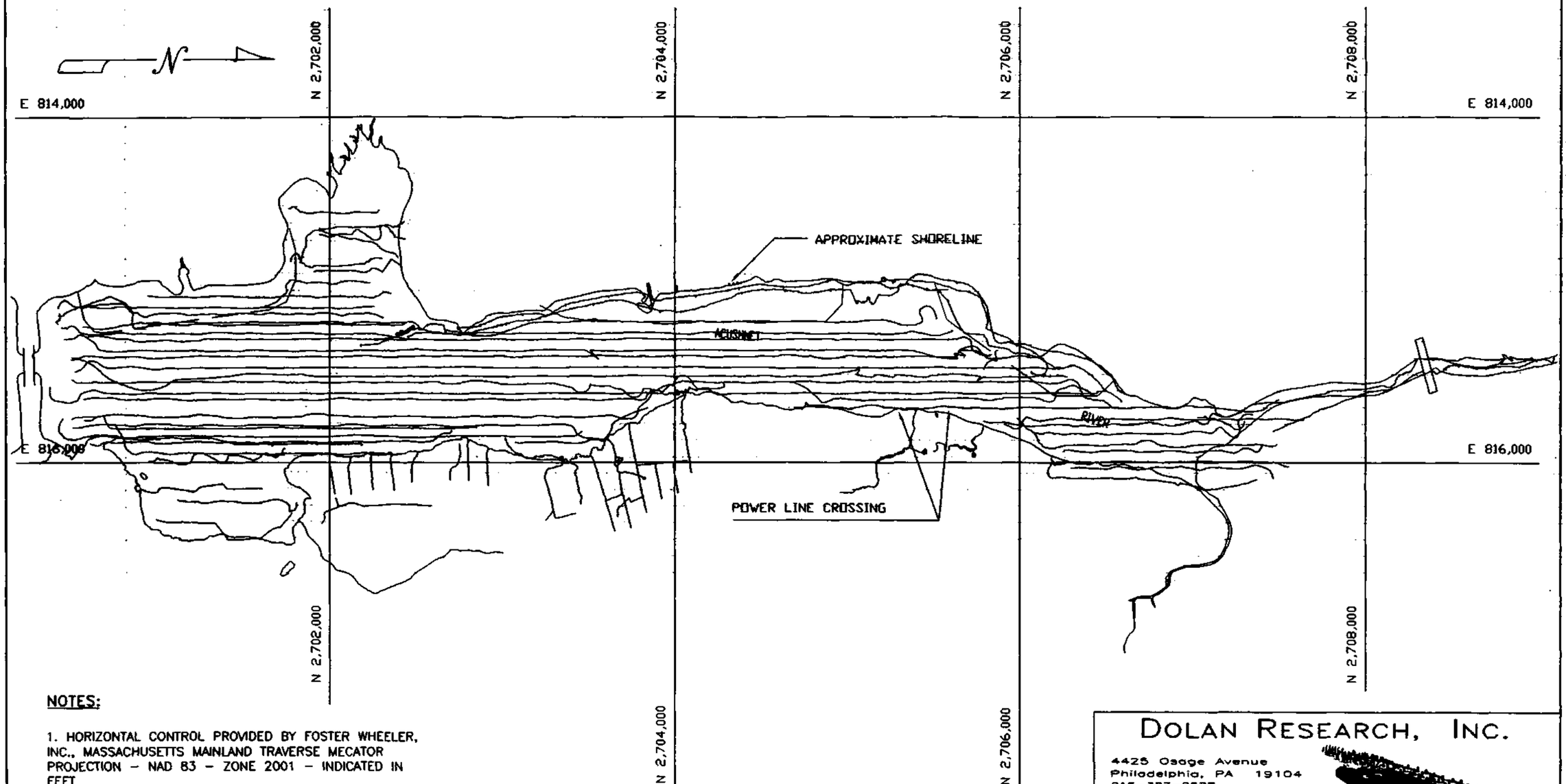


Figure 5-8. Sonar Image - Target 24:693. An 57-foot long section of railroad tracks adjacent to a rock pile.



NOTES:

1. HORIZONTAL CONTROL PROVIDED BY FOSTER WHEELER, INC., MASSACHUSETTS MAINLAND TRAVERSE MECATOR PROJECTION – NAD 83 – ZONE 2001 – INDICATED IN FEET

2. BACKGROUND INFORMATION PROVIDED BY FOSTER WHEELER, INC.

3. SURVEY CONDUCTED ON: 09/04 & 09/11/99.

TRACK PLOT

SCALE IN FEET

600 0 600

300

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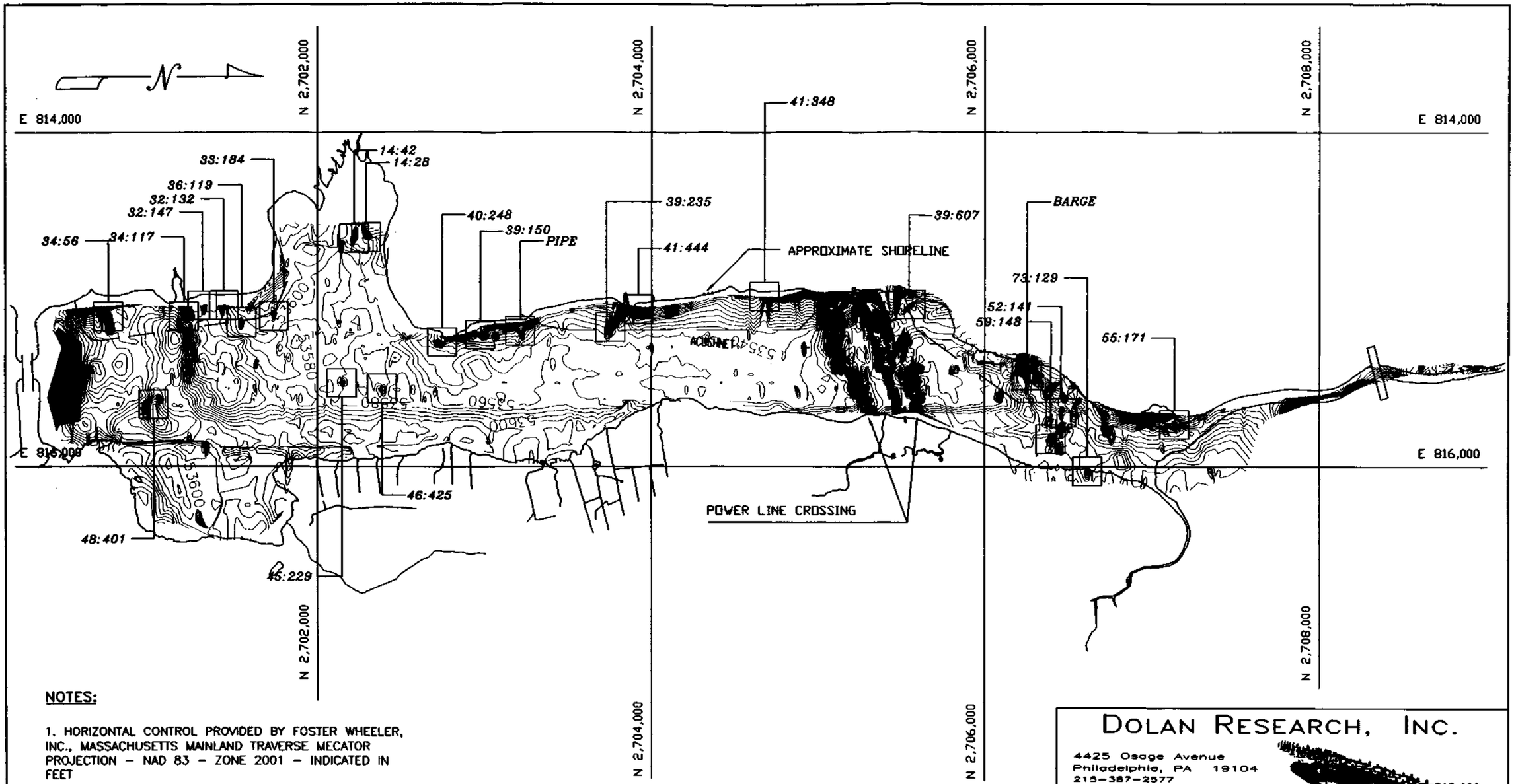
NEW BEDFORD, MA

Figure 5-9. Upper Harbor Area–Track Plot.

DWG. NO. 6



NOTES:

1. HORIZONTAL CONTROL PROVIDED BY FOSTER WHEELER, INC., MASSACHUSETTS MAINLAND TRAVERSE MECATOR PROJECTION – NAD 83 – ZONE 2001 – INDICATED IN FEET
2. BACKGROUND INFORMATION PROVIDED BY FOSTER WHEELER, INC.
3. SURVEY CONDUCTED ON: 09/04 & 09/11/99.
4. MAGNETIC TARGET

MAGNETIC CONTOUR AND TARGET MAP

SCALE IN FEET

600 0 600

300

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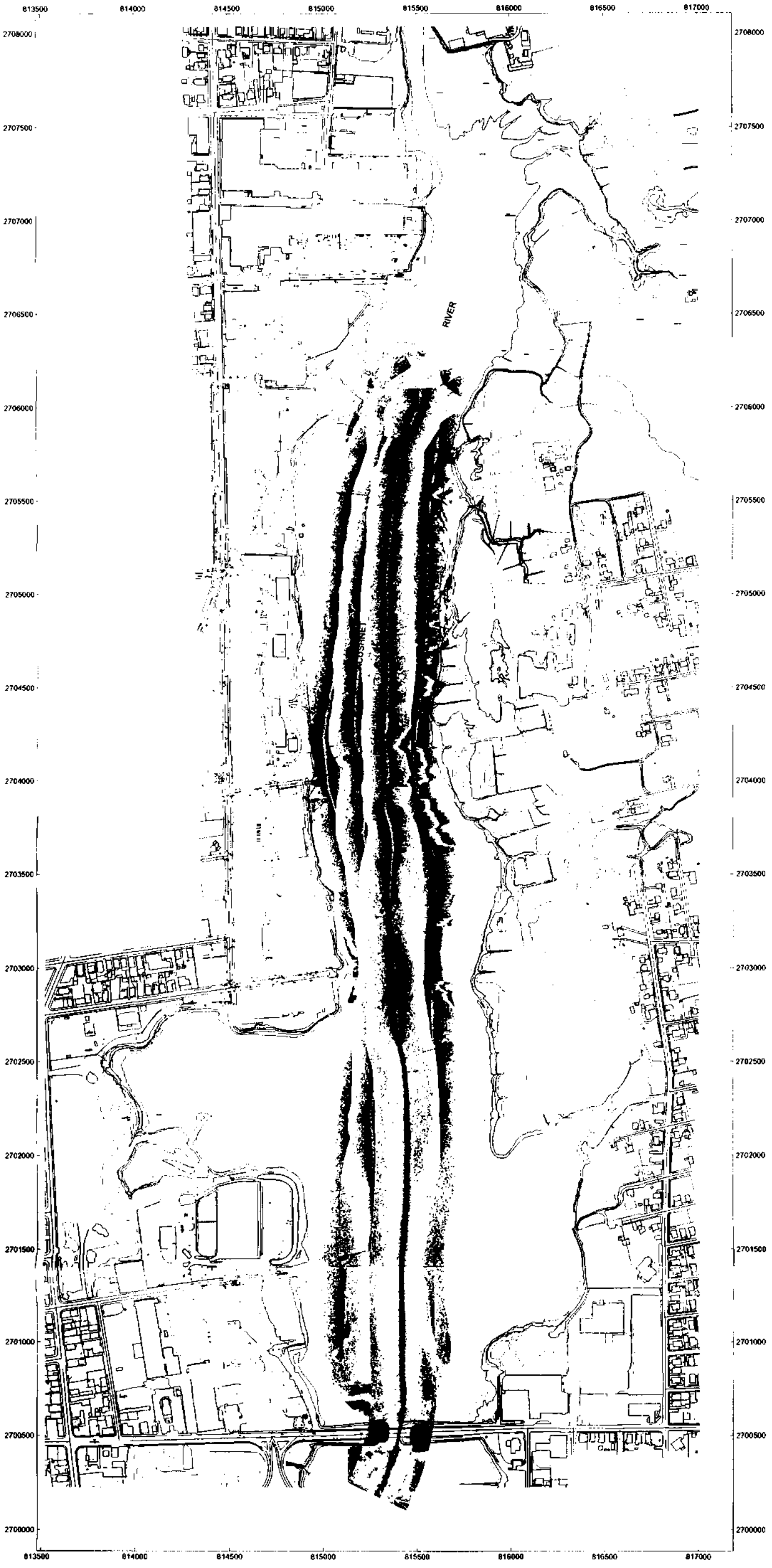
NEW BEDFORD HARBOR, ACUSHNET RIVER
NEW BEDFORD, MA

Figure 5-10. Upper Harbor Area–Magnetic Contour and Target Map.

DWG. NO. 7



Originals in color.

Scale

250 0 250 500 750

feet

US State Plane 1983 Zone Massachusetts Mainland 2001

FOSTER WHEELER

US Army Corps of Engineers New England District

FIGURE 5-11

New Bedford Harbor Superfund Site
New Bedford, Massachusetts
UPPER HARBOR AREA OF INTEREST

SIDE SCAN SONAR MOSAIC PLAN MAP

FWENC Geophysics

PLATES

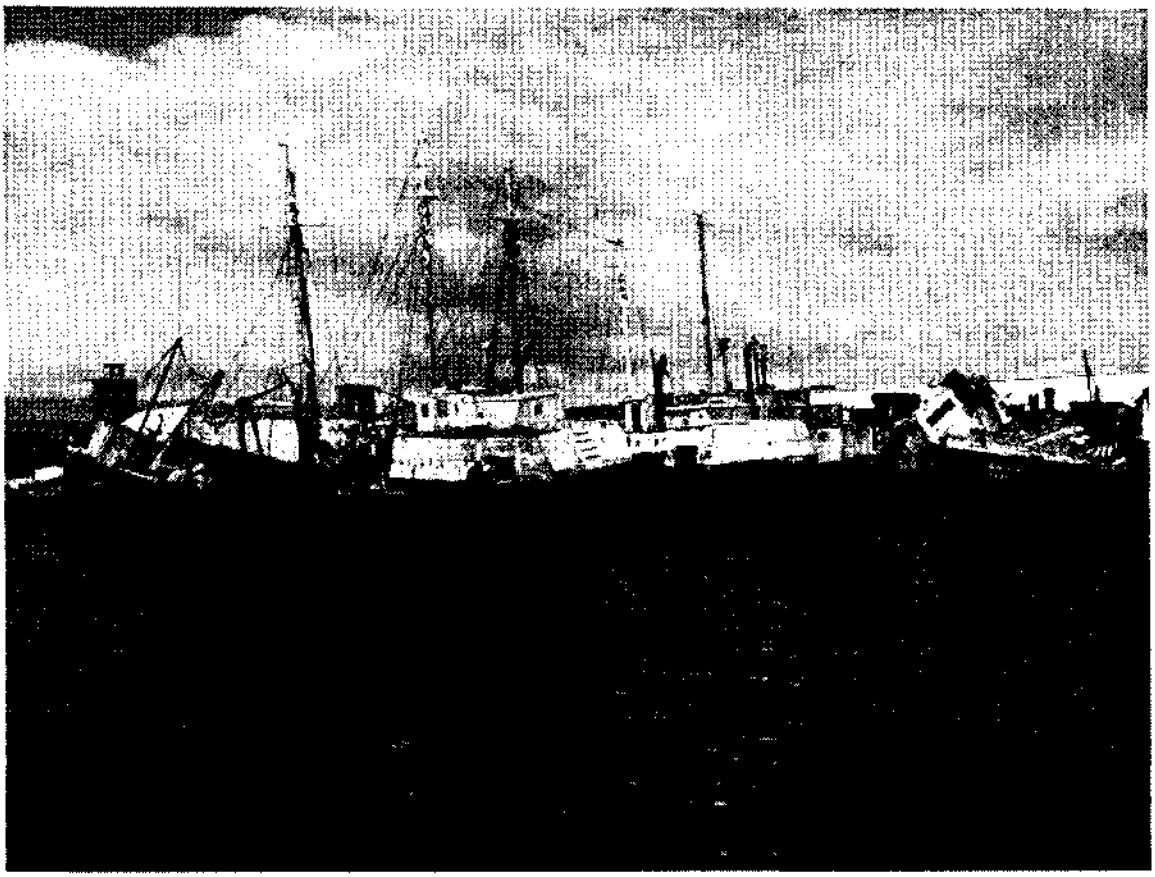


Plate 1. Derelict vessels at Melville shipyard.

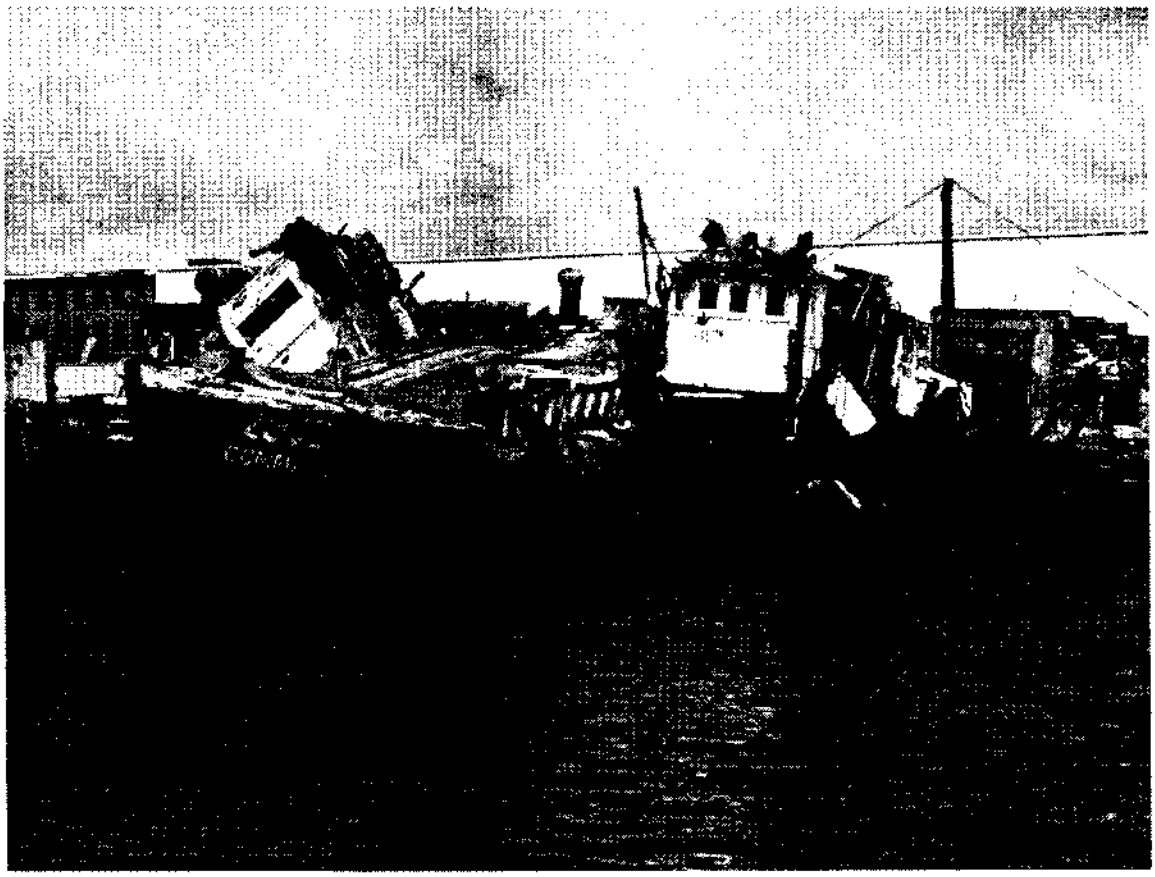


Plate 2. *Commonwealth*, "eastern-rigged fishing vessel.

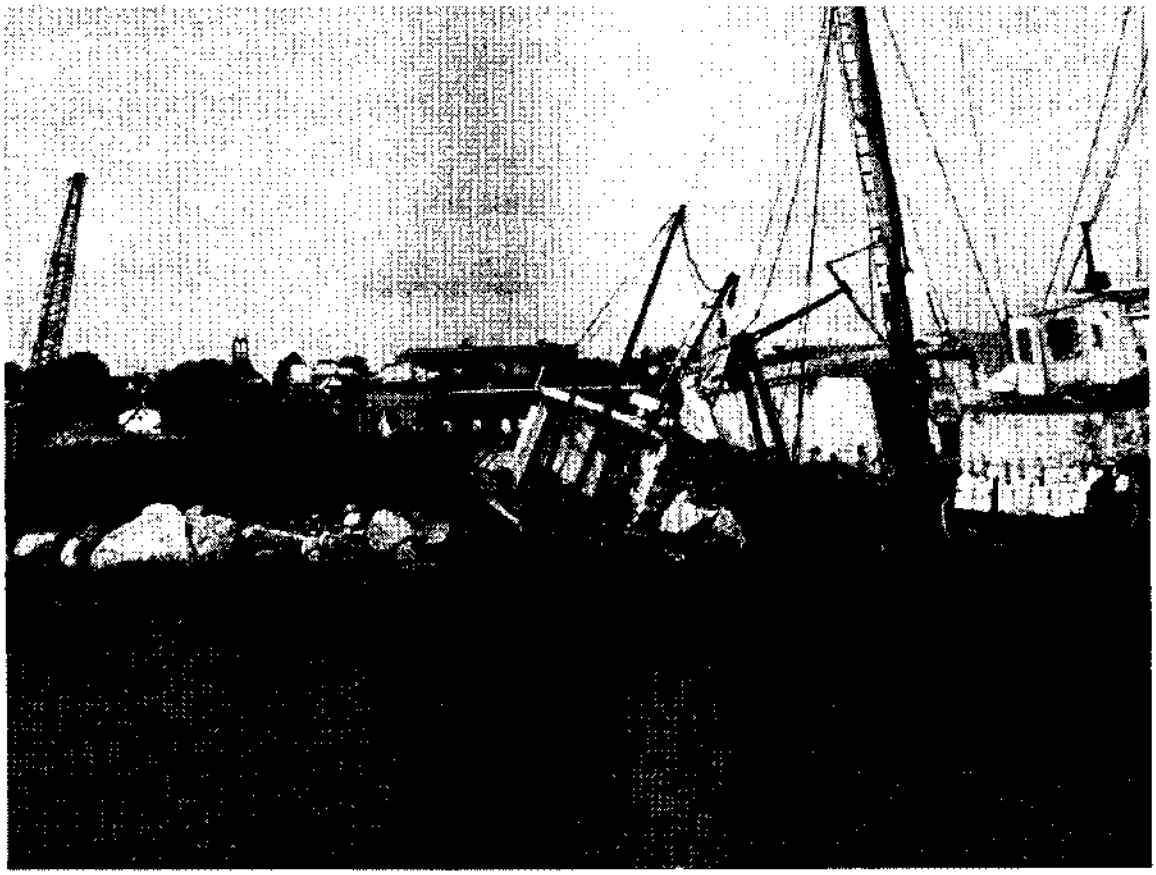


Plate 3. Stern view of two unidentified "eastern-rigged" fishing vessels.

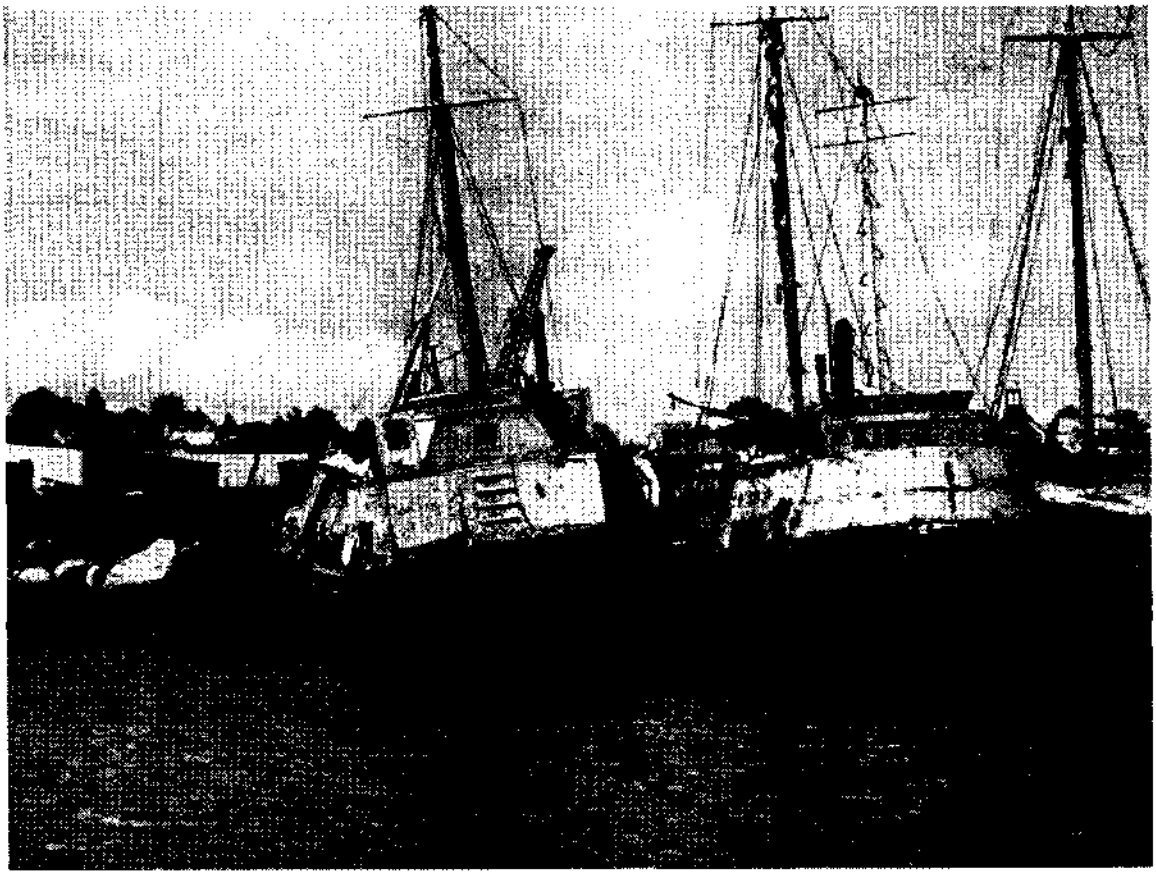


Plate 4. Unidentified "western-rigged" fishing vessel.

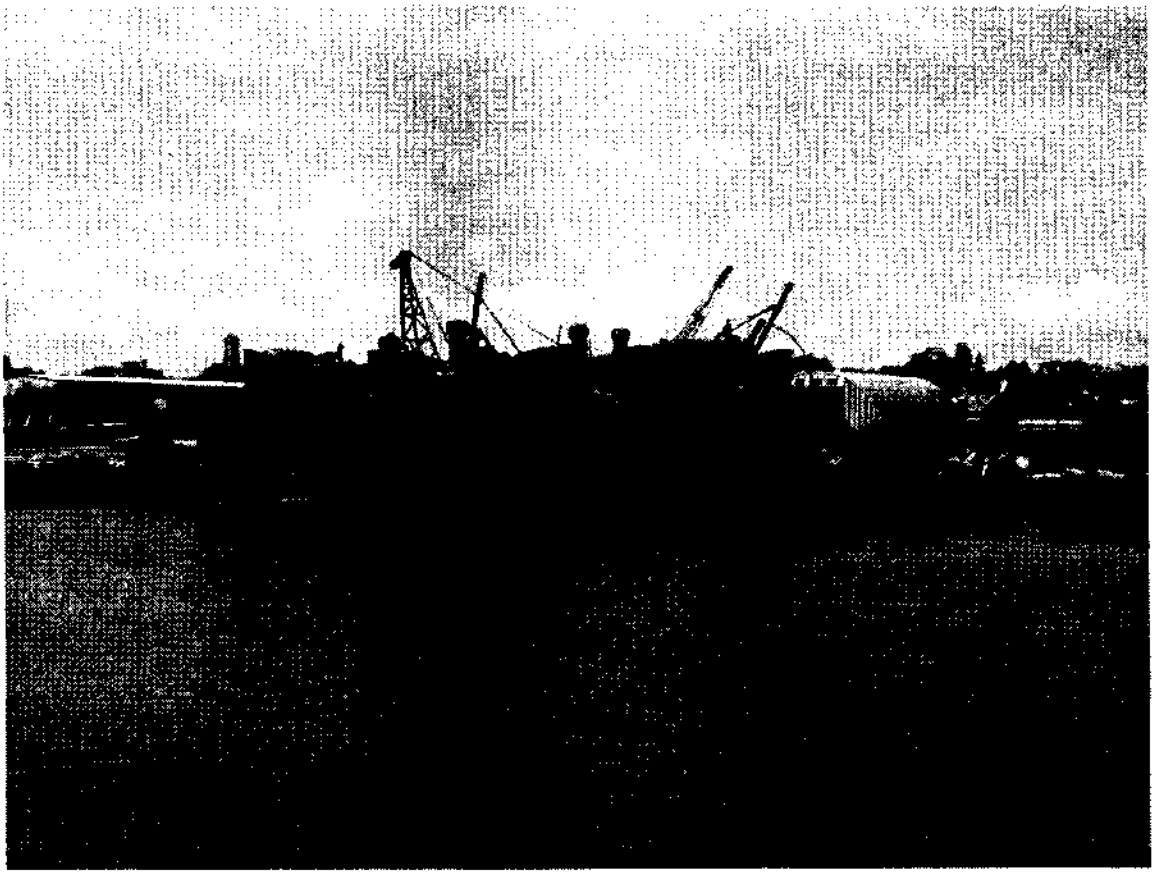


Plate 5. Barge with a fish processing plant.