5494Q USACE 2003

Contract No. DACW51-97-D-0010
Delivery Order No. 75

U.S. Army Corps of Engineers
New York District

CULTURAL RESOURCES ASSESSMENT OF T-GROIN PLACEMENT, ATLANTIC COAST OF NEW YORK, EAST ROCKAWAY INLET TO ROCKAWAY INLET AND JAMAICA BAY, QUEENS COUNTY, NEW YORK, SECTION 934

FINAL REPORT

October 2003

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667 (661)

FINAL REPORT

CULTURAL RESOURCES ASSESSMENT OF T-GROIN PLACEMENT, ATLANTIC COAST OF NEW YORK, EAST ROCKAWAY INLET TO ROCKAWAY INLET AND JAMAICA BAY, QUEENS COUNTY, NEW YORK SECTION 934

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MANAGEMENT SUMMARY

Project Name. Cultural resources assessment of T-groin placement, Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet and Jamaica Bay, Queens County, New York, Section 934.

Project Location and Environmental Setting. The project area comprises approximately 3,000 feet (915 meters) of Atlantic Ocean shoreline between Beach 19th and 40th Streets along Rockaway Beach, Edgemere, Borough of Queens, Queens County, New York (USACE 1999). Located within the Atlantic Coastal Lowland, the project area is part of the barrier island-lagoon system along the south shore of Long Island and the Atlantic Ocean. Elevations within the project area are approximately at sea level.

Purpose and Goals. A cultural resources assessment was conducted at the proposed location of the T-groin installation by Panamerican Consultants, Inc. under contract to Northern Ecological Associates, Inc., Canton, New York, and the U.S. Army Corps of Engineers, New York District. The purpose of the investigation was to review existing data related to barrier island development and the physical and cultural development of Rockaway Peninsula and assess the area's potential to contain buried archaeological resources and to determine whether T-groin placement will impact potentially significant resources or buried land surfaces.

Regulatory Basis. The U.S. Army Corps of Engineers (USACE), as a federal agency, has management responsibilities concerning the protection and preservation of cultural resources on land it uses. Federal statutes require the USACE to identify and evaluate significant cultural resources on these properties, and include: National Historic Preservation Act of 1966, as amended (16 USC 470 *et. seq.*) through 1992 (which includes Section 106 compliance); the Advisory Council on Historic Preservation Guidelines for the Protection of Cultural and Historic Properties (36 CFR Part 800); as well as National Environmental Policy Act of 1969 (40 CFR Parts 1500-08).

Cultural Resources Survey Work Completed. Archival and documentary research and a walkover reconnaissance of the onshore portion of the project area were conducted as part of the cultural resources assessment. Background research included a review of files and documents from the New York State Historic Preservation Office; the New York Public Library, Map, Local History, and General Research divisions; Queens Borough Public Library, Long Island Division; New York City Municipal Reference Library; the New York State Museum; and the New York City Landmarks Preservation Commission. No field testing or coring was conducted in the project area as per the scope of work (USACE 1999).

Survey Results. The review of barrier island development, the past and present environmental setting and the cultural history related to the Rockaway Peninsula was only partially successful in answering questions of cultural resource potential within the project area. The background review along with a reconnaissance inspection reveals that apart from the remnants of recent wooden and stone groins, no prehistoric or historic resources are visible, or are likely to be present, on the beach and adjacent ocean floor surface. The lack of any paleoenvironmental and remote sensing

data specific to the project area makes the assessment as to the probability of submerged resources difficult. Nonetheless, the likelihood of buried prehistoric landforms/resources is considered low, while the probability of buried historic resources (i.e., remains of structural features associated with 1890s and 1901-1912 beach front buildings and possible shipwrecks) is considered medium to high.

Conclusions and Recommendations. The conclusions and recommendations take the following format:

Location and Type of Possible Cultural Resource	*Assessment/Recommendation*
Beach/Adjacent Current Ocean Floor Surface	
Prehistoric landform/site	low, none visible; no further work
Historic resources	formerly present, none visible; no further work
Subsurface Beach/Submerged Ocean Floor	
Prehistoric site/landform	low; no further work
Historic resources (e.g., shipwrecks)	medium to high; Phase IB Survey

The Phase IB remote sensing survey should include the use of magnetometer and side scan sonar equipment to locate the most likely potential resources representing the remains of the structural features (a groin, pier) associated with the turn of the century beach front buildings and possible shipwrecks. The New York State Office of Parks, Recreation and Historic Preservation (State Historic Preservation Office) concurs with the recommendations presented in the report.

Location of file copies of report. Copies of this report are on file at USACE, New York District, New York and the New York State Historic Preservation Office, Peebles Island, Waterford.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS continued.

LIST OF TABLES

ACKNOWLEDGMENTS

Panamerican Consultants, Inc. wishes to thank Ms. Nancy Brighton, archaeologist at the New York District Office of the U.S. Army Corps of Engineers, for her guidance and suggestions related to various phases of the project.

Ms. Cynthia Blakemore of the New York State Office of Parks, Recreation and Historic Preservation, and Ms. Beth Wellman of the New York State Museum were of assistance in obtaining background data.

In-house personnel who contributed to the production of the report included Ms. Peggie Billittier (word processing) and Mr. Martin Lewars and Mr. Carl W. Thiel (graphics). Mr. Thiel also edited the document. The report was produced under the supervision of Mr. Mark A. Steinback.

1.0 INTRODUCTION

Panamerican Consultants, Inc. (PCI), under contract to Northern Ecological Associates, Inc., Canton, New York, conducted a cultural resources assessment at the locations of proposed T-groin installation along approximately 3,000 feet (915 meters) of Rockaway Beach, Edgemere, Queens County, New York (Figures 1 and 2). The proposed project is being conducted by the New York District Office of the U.S. Army Corps of Engineers (USACE).

The purpose of the investigation was to review existing data related to barrier island development and the physical and cultural development of Rockaway Peninsula to assess the potential of the area of proposed construction to contain buried archaeological resources, and to determine whether T-groin placement will impact potentially significant resources or submerged/buried land surfaces. The investigation was conducted in December 1999 and January 2000. Panamerican personnel involved with the project consisted of Dr. Michael A. Cinquino, Project Director; Dr. Michele H. Hayward, Co-Principal Investigator; Mr. Mark A. Steinback, Historian; and Mr. Stephen R. James, Maritime Archaeologist. Mr. Arnold Pickman served as Co-Principal Investigator and primary author. Dr. Edward V. Curtin drafted the paleoenvironment overview. Mr. Steinback organized the document under Dr. Cinquino's supervision.

The cultural resources investigation was conducted in compliance with the following federal laws and regulations: National Historic Preservation Act of 1966, as amended (16 USC 470 *et. seq.*) through 1992 (which includes Section 106 compliance); National Environmental Policy Act of 1969 (42 USC 4371 *et. seq.*); Historic Preservation Act of 1974 (16 USC 469-469c); and the Advisory Council on Historic Preservation (ACHP) Guidelines for the Protection of Cultural and Historic Properties (36 CFR Part 800); as well as New York Archaeological Council (NYAC)'s Standards for Archaeological Investigations.

1.1 PROJECT DESCRIPTION

A proposed series of T-groins are to be constructed within a 3,000-foot- (915-meter-) long portion of Atlantic Ocean shoreline (Rockaway Beach) extending between the approximate locations of Beach 26th and Beach 39th Streets, Edgemere, Borough of Queens, Queens County, New York (see Figures 1 and 2). The current project area is part of a 6.2-mile section of the Rockaway Beach shoreline between Beach 19th to Beach 149th Streets that has been subject to ongoing beach protection measures (e.g., periodic renourishment of eroded beach areas through the placement of sand fill material). The location of the proposed T-groin placement has been identified as an area of high erosion within the existing beach renourishment area. The T-groins

> will consist of a timber sheet pile trunk section that ties into a rubble mound, or T-head, off shore (Figures 3 and 4). The along-shore crest of each T-head (portion parallel to shore) will be 400 feet [122 m] long. The length of each T-groin (perpendicular to shore) will vary between 425 and 475 feet [130 and 145 m], depending on its location, in order to ensure the desired shoreline alignment. The [on-shore] terminus of the trunk section will be approximately 50 feet [15 m] seaward of the boardwalk. The T-groin trunks will be spaced approximately 800 feet [244 m] apart [USACE 1999].

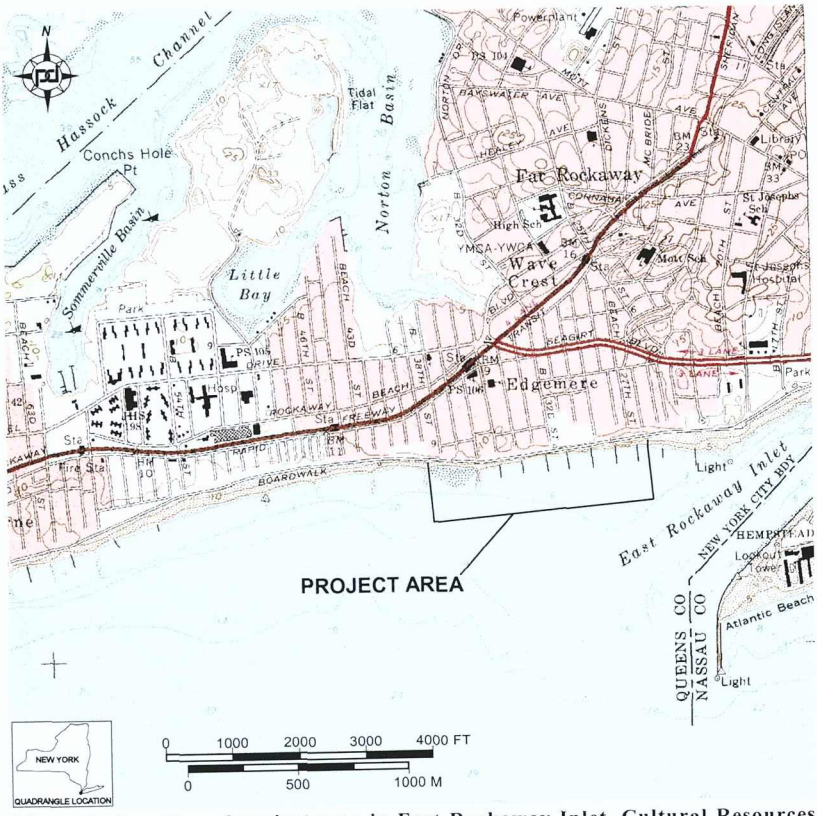


Figure 1. Location of project area in East Rockaway Inlet. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(USGS Topographic 7.5 minute Quadrangle Far Rockaway, New York, 1969).*

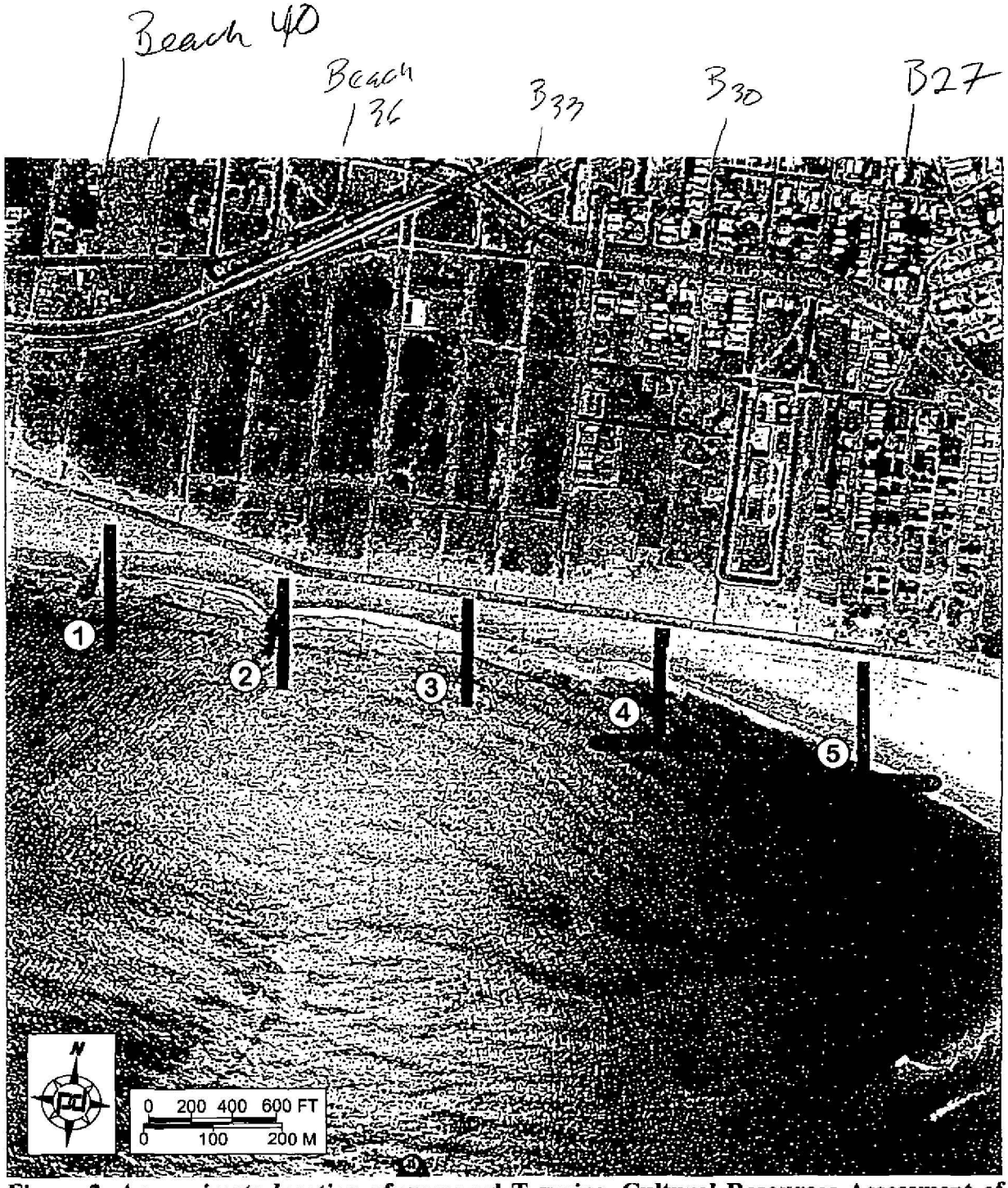


Figure 2. Approximate location of proposed T-groins. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(USACE 1999:Figure 2).*

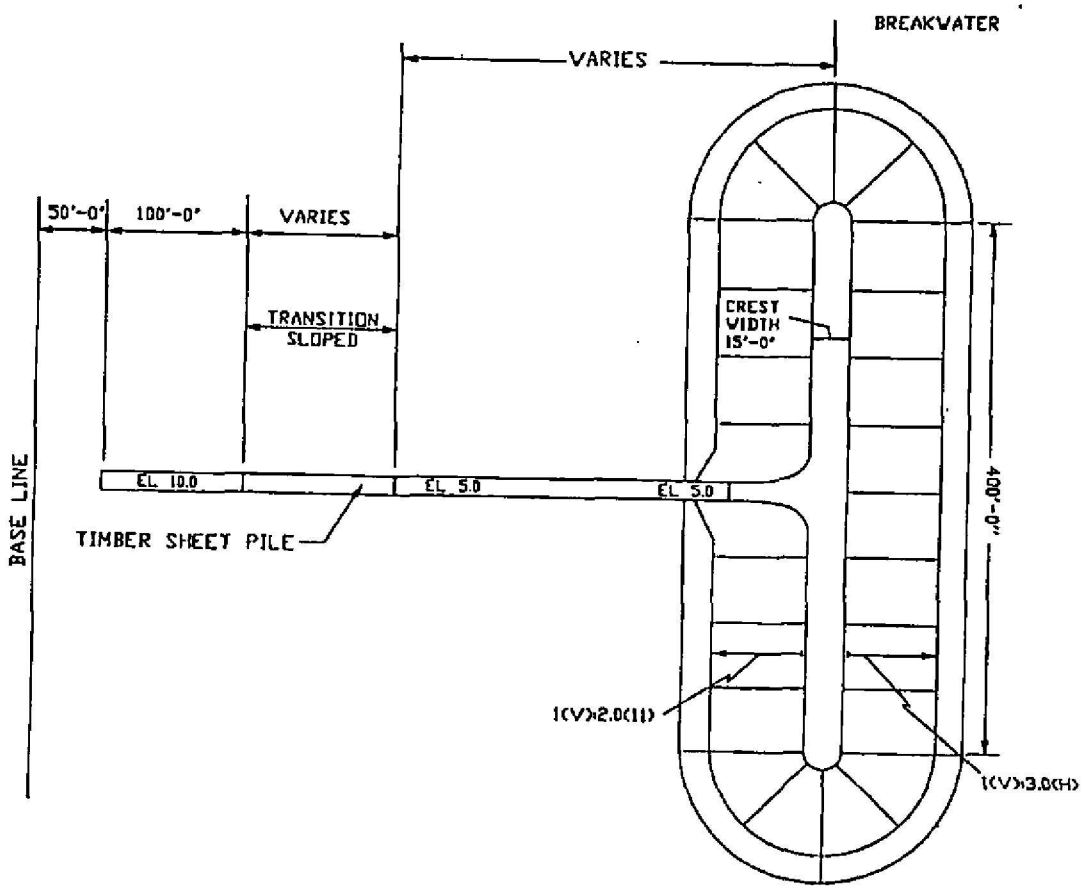


Figure 3. T-groin plan: overhead view. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(USACE 1999:Figure 3a).*

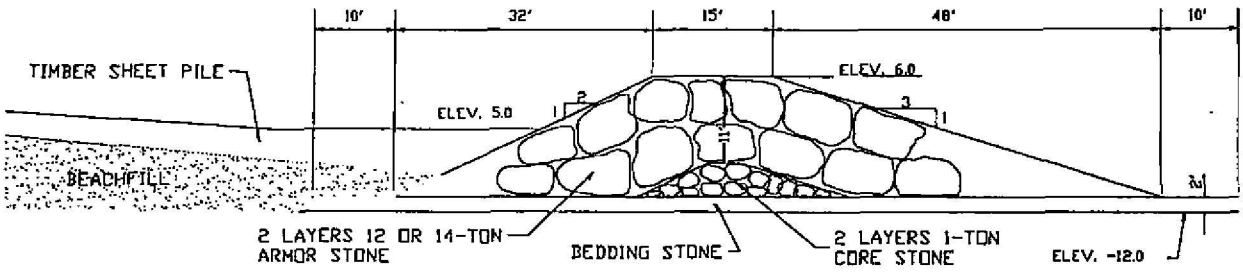


Figure 4. T-groin plan: cross-section. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(USACE 1999:Figure 3b).*

T-groin construction will involve the driving of sheet piles along the routes of the trunk sections, with the T-head portions requiring the placement of a considerable amount of rubble material within the near-shore zone. The T-head portion alone of each of the structures encompasses an area some 115 ft (35 m) wide and 400 ft (122 m) long (USACE 1999; Figures 3 and 4). We interpret the -12.0 ft elevation measure in Figure 4 as indicating that the base of the T-groin will be twelve feet below the National Geodetic Vertical Datum (NGVD), with construction likely affecting a deeper depth than the actual completed base of the T-groin. Although not indicated on Figure 2, all of the T-groins will possess a trunk and head section. "The two groins along the [western] edge of the project area, T-groins 1 and 2, are sited at locations of existing rubble mound groins and construction of the proposed groins will utilize material from [these] existing groins" (USACE 1999:2f).

2.0 BACKGROUND RESEARCH AND CULTURE HISTORY

2.1 ENVIRONMENTAL SETTING

Part of the Atlantic Coastal Lowland, Long Island was augmented by glacial advance (the terminal moraine of the last glaciation bisects the island), which dumped a conglomeration of materials across its length. A broad outwash plain extends south of the moraine to the ocean. The present beaches along the south shore —Jones, Long and Rockaway— "are the result of wave action and longshore currents which have developed barrier beaches, lagoons, and spits, with sand bars, out of materials deposited earlier by glacial melt waters" (Cressey 1977:34-35, 43). The federal government has estimated that approximately two-thirds of the sediment for all of the southern beaches and barrier islands is derived from the erosion of Montauk Point with the balance coming from onshore drift of outwash sediments from the shallow sea floor south of Long Island (Van Diver 1985:73).

Long Island's beaches or barrier islands extend from Southampton at the eastern end of the island westward to Jamaica Bay and

> protect the deeply indented estuarine coast from the open sea. The islands include the Shinnecock Bay barrier, or Southampton and Tiana beaches, Hampton Beach, Pikes Beach, Great South Beach or Fire Island, Gilgo Beach, Jones Beach, Long Beach, and Rockaway Beach. These narrow, offshore strips of sand react with extreme sensitivity to the wind, waves, and longshore currents, and constantly change. . . . Separation of the barrier islands from the land increases from east to west, reaching a maximum of about 6 miles at Jamaica Bay. Over that long distance, the islands are breached by only 4 tidal inlets, at Shinnecock and Moriches bays and the western ends of Fire Island and Jones Beach. The broad lagoons behind the barrier islands protect the coast from direct onslaught of the sea; as a result the south coast has seen extensive development, urban sprawl, at the western end [Van Diver 1985:75].

Geological Summary. The project area lies within the Atlantic Coastal Plain geological province, which extends along the eastern margin of the United States and consists of "loose unconsolidated Cretaceous to Recent sediments resting on the deeply buried crystalline rock floor" (USACE 1974). The Coastal plain slopes gently to the southeast, extending beneath the Atlantic Ocean about 100 miles offshore to the edge of the continental shelf, at which point the ocean bottom drops abruptly from approximately 100 fathoms to much greater depths.

The southern shore of Long Island is underlain by eight geological units of unconsolidated deposits and bedrock. The surficial material is "beach and eolian sand, medium to coarse grained, and [including] scattered shell fragments" (Dvirkin and Bartillucci 1985). These and other Holocene deposits discussed in Section 3.3 are underlain by Pleistocene deposits followed by Cretaceous material.

During the successive Pleistocene glaciations, sedimentation within the project area corresponded to alternating periods of marine transgression and regression across the project area. The southern half of Queens and Kings counties represents a low outwash plain sloping gently southward towards the ocean and lying south and southeast of the terminal moraine formed during the final

(Wisconsin) stage of Pleistocene glaciation. No large streams developed on this plain due to the permeable nature of the subsurface deposits (USACE 1965, 1974). The Pleistocene glacial outwash deposits consist of sand mixed with some gravel. This material rests directly upon Cretaceous deposits. The subaerial portion of the outwash plain "merges into the tidal marshes of the shallow bays and the barrier beaches along the shore of Long Island" (USACE 1965).

Formed by a reworking of sediment deposits by ocean currents and waves, Rockaway Beach and Jamaica Bay represent one of the series of barrier island-lagoon systems that extend along the southern shore of Long Island (USACE 1973:A2; Dvirkin and Bartillucci 1985). As noted, these barrier islands are landforms "built up over the past several thousand years by sand from the sea floor and by sand transported westward along the Long Island shoreface by wave-generated longshore currents" (Williams 1976:15).

Although included as part of the series of Long Island barrier islands, Rockaway Beach is actually a landform known as a barrier bar, since it is attached to the mainland at its eastern end, rather than being completely surrounded by water (Yasso and Hartman 1975:14). The islands within Jamaica Bay and areas adjoining its shoreline represent salt marsh deposits which have developed within geologically recent time. Large portions of these marsh areas are covered by landfill deposited largely during the twentieth century.

Hydrology and Soils. The barrier-lagoon system along the south shore of Long Island has been studied by Sanders and Kumar (1975), Rampino (1979), and Rampino and Sanders (1980, 1981). These studies are based on an analysis of borings and vibracores taken both within the lagoon (Great South Bay) and offshore of Jones Beach and Cedar Beach.

Two Pleistocene glacial outwash stratigraphic units, consisting of brown sands and gravels, have been recognized. The lower depositional unit is known as the Merrick Formation and the upper unit, which constitutes most of the surficial deposits on southern Long Island, as the Bellmore Formation. At some locations a late Pleistocene deposit, the Wantagh formation, is interbedded between the two outwash stratigraphic units. The latter stratum represents material deposited during Pleistocene marine advances (prior to the final advance of the Wisconsin glaciation) and consists of gray, compact silty clays and silty sands and a lens of coarse to fine-grained sands of probable barrier-island origin (Rampino and Sanders 1980:1068).

Rampino and Sanders (1980) correlate the various Holocene deposits with engineering descriptions as given in various core logs as follows:

> Salt and brackish water marsh deposits – "Meadow mat" or gray to brown peat and gray to black organic silty clay with roots
>
> Lagoonal silty clays – Soft, gray to black, organic silty clays, sometime containing shells or shell fragments. Samples examined in the lab are olive-gray silty clays high in organic material
>
> Backbarrier sands – Medium gray to olive-gray fine to coarse-grained sands. These sands contain shells and occasional layers of organic silt.

Barrier island sands – Very dense, white to light tan, fine to coarse-grained sands with some gravel (usually less than 10%) in places and containing shells.

As discussed below, with a slow rise in sea levels, saltmarsh peats or organic silts/clays would have formed in lagoons behind the barrier islands. Rampino (1979) suggests that accumulation of marshy peat deposits as opposed to open lagoonal silts and clays would be related to the rate of submergence, with a slower rate of submergence enabling sedimentation to build the lagoon floor to a level at which marsh grass could become established. He thus relates the development of the extensive salt marshes in the present lagoon to the reduced rate of sea level rise which began ca. 3000 BP (ca. 1000 BC) (Figure 5). In the area immediately north of the present barriers, the peat and lagoonal silts/clays are overlain or mixed with backbarrier sands. Such sands are deposited during storms, leading to the creation of "wash-over fans," or by tidal currents flowing through present or former inlets which deposit "flood-tidal delta lobes."

2.2 PALEOENVIRONMENT

Models derived from floral remains and Pleistocene fauna indicate the likelihood that the last glacial ice (the Wisconsinian) in southeastern New York State had disappeared earlier than 15,000 years ago (WES 1995:30; Funk 1993:43-44; Marshall 1982:17). Tundra-like conditions probably existed near the terminal moraine in western Long Island as the land responded to changing drainage patterns in the wake of the receding glacier. As a result of the advances and retreats of glacial ice, several ridges were formed on Long Island as well as numerous kettle ponds, eskers and barrier beaches (Cressey 1977:19-23, 43).

Pleistocene megafauna included such species as mammoth, mastodon, great beaver, fossil bear, and northern species like fox, seal, moose and caribou. A variety of other species like fossil peccary, white-tailed deer, elk, bison and horse roamed the northeast as well (Marshall 1982:17-18; Funk 1972:11, 1976:208-210; Ritchie 1980:10-11). At the end of the Pleistocene era, western Long Island was cut in half by the Wisconsin terminal moraine.

Grassy tundra environments like those that would have been found in higher elevations during the late Pleistocene were preferred by mammoths and caribou who were primarily grazers. Conversely, mastodons were browsers who preferred wooded spruce areas located at lower elevations in the valleys (Funk 1972:11; Marshall 1982:18). With deglaciation, the megafauna began to decline and were replaced by more temperate species that migrated into the area. There is some evidence that proboscidians were still present by the time Paleo-Indians arrived in the Northeast and were hunted into extinction (Marshall 1982:18; Gramly and Funk 1990). Caribou herds probably survived in southeastern New York beyond the time of the megafauna extermination.

Following the Pleistocene era, environmental conditions ameliorated leading to the reforestation of the northeast and the gradual emergence of modern types of forest about 10,000 years ago. Between 8,000 and 10,000 years ago, the hills and mountains were overgrown with pine, hemlock

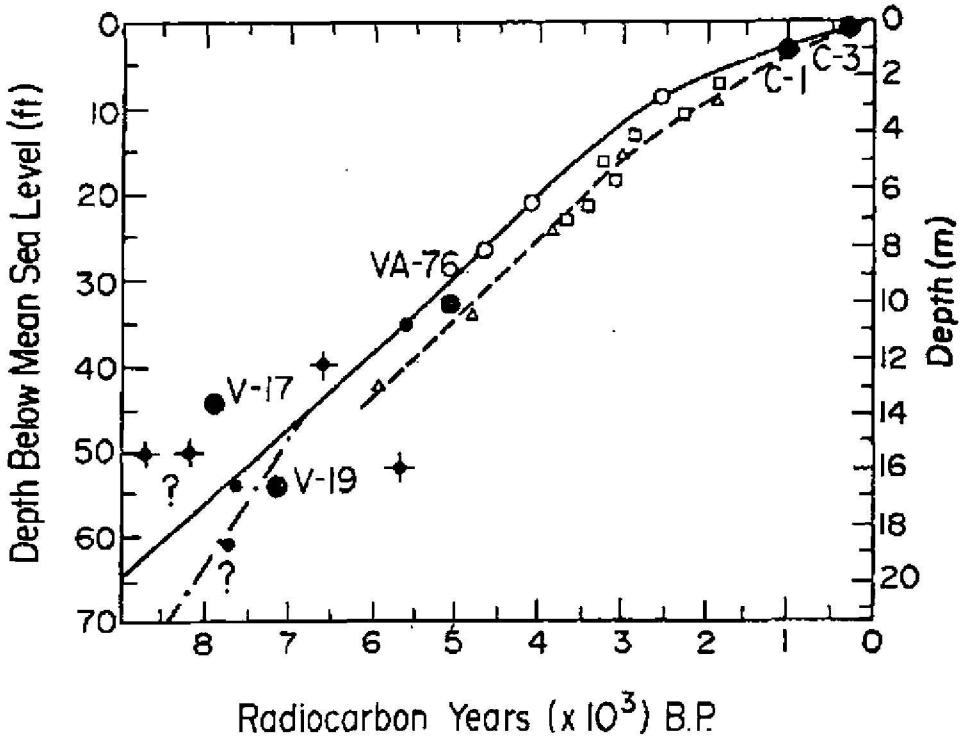


FIG. 7.—Submergence curve for southern Long Island during the past 8000 years (solid curve). The curve is based on radiocarbon-dated samples reported in this paper (large solid circles) and on previously published dates from northern Long Island (Caldwell and Sanders, 1973; Williams, 1976) (crossed solid circles), southern Long Island (Kumar, 1973; Williams, 1976) (small solid circles), and Iona Island, New York (Newman and others, 1969) (open circles). The dashed and dotted curve indicates possible submergence rates of ~50 cm/100 years prior to 7000 YBP suggested for adjacent areas (Curray, 1965; Kraft, 1977). The dashed curve is drawn through points of dated samples from New Jersey (Stuiver and Daddario, 1963) (triangles) and Cape Cod, Massachusetts (Redfield and Rubin, 1962) (open squares). An assumption of relatively smooth change in sea level has been made in constructing these curves.

Figure 5. Submergence curve for south Long Island. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Rampino and Sanders 1980:1074).*

and oak, while forests in the coastal areas were chestnut and oak (Funk 1976:209-210; Marshall 1982:21; Kraft and Mounier 1982:59-60). The retreating glacier caused a rise in sea levels and people were compelled to move inland.

After the glacial retreat, coastal New York was a mosaic of tundra and forests composed of a mixture of coniferous and hardwood trees, dominated by pine, arctic willows, spruce and fir. This mixture eventually yielded to oak and birch, and by 8,500 years ago to oak and chestnut (Marshall 1982:17; Funk 1972:10; Salwen 1975; Kraft and Mounier 1982:59).

Pollen analysis of samples from the Shawnee-Minisink site near the Delaware Water Gap has revealed the presence of many edible plants. Paleo-Indian tools were found in association with fish bone fragments and wild hawthorn plum seeds along with charcoal which dated to 10,590 BC $\pm$ 300 (Salwen 1975:45). Carbonized seeds were recovered by flotation (Kauffman and Dent 1982), and

were identified as representing such plants as goose foot (*Chenopodium* sp.), ground cherry, blackberry, hawthorn plum, pokeweed, pigweed (*Amaranthus* sp.), smart weed (*Polygonum* sp.), wild lettuce, grape, hackberry, and meadow grass (Kraft 1986:41).

Immediately prior to the arrival of Europeans, local forests supported numerous animal species, both large and small. A number of deer, bear, raccoon, otter, and bobcat shared the forests and streams with smaller animal populations, including chipmunk, squirrel, wild turkey, and muskrat. Migratory birds also made their seasonal appearances. The region's intertidal zone and marshy areas provided a rich variety of fish and crustaceans.

Present Climate. Although lying within the province of a maritime climate, Queens County has weather patterns more closely resembling a continental variety, since fronts and storms that affect the area generally arise from the interior of the United States and Canada. These weather patterns, however, can be modified or displaced by systems from the tropics, as evidenced by the incidence of Nor'easters during the winter and the occasional tropical storm in the late summer. During the winter, cold air masses from Canada prevail, affecting the area to a greater extent than during the summer. While winter temperatures average 33°F (1°C), low temperatures can dip into the teens for extended periods, with January and February being the coldest months. Average seasonal snowfall amounts hover around 30 inches (76.2 centimeters), although single snow fall amounts occasionally reach double digits.

During the warm, humid summer, the area's average temperature is 69°F (20°C), although summer temperatures can reach over 100°F (38°C) for extended periods, especially in late July and August. While Queens County endures strong late afternoon thunderstorms during the summer, the area's proximity to open water allows for good wind circulation. Annual precipitation averages about 41 in (104 cm), with a fairly even distribution of moisture throughout the year.

2.3 Cultural History of the Project Area

General Prehistoric Cultural Background. The prehistory of northeastern North America is marked by three major periods spanning about 12,000 years. The earliest of these periods is the Paleo-Indian which lasted from 10,000 to 8000 BC. Living in seasonal camps near fresh water sources and lithic workshops, Paleo-Indians subsisted by hunting and gathering. The Paleo-Indian period was followed by the Archaic period which lasted from 8000 to 1000 BC and was characterized by seasonally occupied campsites and later by seasonal villages. The Archaic subsistence system was hunting and gathering with possibly incipient horticulture toward the end of the period. After 1000 BC, Native Americans of the Woodland period lived in seasonally occupied villages and campsites and subsisted by hunting, gathering and horticulture by AD 1000. During this period ceramics were first made in northeastern North America. These periods are described in more detail below.

Paleo-Indian Period. Paleo-Indian cultures were adapted to a late-Pleistocene tundra or park tundra environment. Paleo-Indians were highly mobile people who needed to travel over long distances to obtain food. About 12,000 years ago, the coastal New York environment was a mosaic of tundra and forests that were predominantly arctic willows, pine, spruce and fir which eventually gave way to birch and oak (Funk 1972; Marshall 1982:17). The emergence of oak stands and subsequent increase in resource availability allowed greater human population density toward the end of the period.

The late-Pleistocene tundra or park tundra environment provided important habitats for large mammals and other game potentially significant for human subsistence. According to Marshall, megafauna were still around when the Paleo-Indians arrived in the area. "Contemporaneity of early Paleo-Indian hunters and these animals has been established by radiocarbon dated remains of the megafauna excavated from areas in northern New Jersey, New York, and Pennsylvania" (Marshall 1982:18). Dent, however, suggests that both mammoth and mastodon were extinct 1,000 years before humans arrived in the Upper Delaware Valley and that the tundra environment had succumbed as well (Dent 1991:136). This hypothesis also may be true for coastal New York.

During the late glacial/early postglacial period, caribou likely were hunted by the Paleo-Indians as evidenced by caribou bone found at the Dutchess Quarry Cave No. 1 site in association with a fluted point (a primary diagnostic artifact of the Paleo-Indian period). The bone was radiocarbon dated to 10,580 $\pm$ 370 BC. Additional fluted points were found at Dutchess Quarry Cave No. 8. Funk and Steadman (1994:53) pointed out that the caribou bone and fluted point found at Cave No. 1 were in the same stratum, but not otherwise in close association. The caribou may have preceded the fluted points at the Dutchess Quarry Caves. With deglaciation, the megafauna began to decline and were replaced by more temperate species that migrated into the area. During the 2,000-year Paleo-Indian period, human subsistence shifted from large Pleistocene game like caribou to more familiar, modern, mid-latitude species such as white-tailed deer (Eisenberg 1978). Fish, crustaceans and plants were also abundant in the wetlands/coastal environment during the early post-glacial period. In addition to hunting, fish and plant foods were available to Paleo-Indian groups. Pollen analysis of samples from the Shawnee-Minisink site near the Delaware Water Gap has revealed the presence of many edible plants (see Section 2.2).

Early Paleo-Indian chipped-stone artifacts include fluted points—thin, lanceolate-shaped bifacial implements fluted down the center for hafting—unifacial end- and side-scrapers, utilized flakes, and waste flakes (Marshall 1982:13). Cryptocrystalline stones like jasper and chert were the preferred raw materials of Paleo-Indian tool makers. Cherts, including Normanskill, Deepkill, Fort Ann, Eastern Onondaga, Helderberg, Esopus, Pennsylvania jasper, and those from Delaware and Maryland, are found on archaeological sites in Southern New York. Fluted points and other Paleo-Indian artifacts made from Pennsylvania jasper and various cherts were found at the Port Mobil site on Staten Island (Kraft 1977, 1986:34; Ritchie 1980:3). Fluted points gradually decreased in size as larger game animals moved north or became extinct (Kraft 1986:47) and were eventually replaced in the late Paleo-Indian/ Early Archaic transition (8000-6000 BC) with unfluted triangular points, stemmed points and Plano points. The last are lanceolate-shaped points without flutes. In

Monmouth County, New Jersey, Late Paleo-Indian artifacts including unfluted triangular points, and Hardaway Dalton points were found at the Turkey Swamp site which dated to between 7041 and 5939 BC (Marshall 1982:33). These dates demonstrate an overlap between the Paleo- Indian and Early Archaic periods. According to Kraft (1986), the transition from Paleo-Indian to Early Archaic is not clearly delineated in the Middle Atlantic region.

Archaic Period. The Archaic period, which began after 8000 BC developed out of the late Paleo-Indian. Between 8000 and 6000 BC the hills and mountains were overgrown with pine, hemlock and oak while forests in the coastal areas were populated with chestnut and oak (Kraft and Mounier 1982:59). The retreating glacier caused a continuing rise in sea levels forcing people to move away from the coast.

Aside from occasional technological changes and gradual environmental transformation, life continued much the same as it had in the previous period. People still lived in small territorial bands that hunted, fished, and gathered plant foods. With the exception of the dog, they had no domestic animals (Kraft 1986:51). People of the Early Archaic period subsisted on anadromous fish, shellfish, berries, roots, tubers, eggs, nuts, and deer (Kraft 1986:51). They probably moved when food supplies dwindled. The small encampments close to rivers, swampy areas or ponds that are typical of Early Archaic sites reflect this mobility (Kraft and Mounier 1982:76; Nicholas 1988).

The Early Archaic tool kit consisted of projectile point forms related to those of the Carolina Piedmont (Brennan 1977; Ritchie and Funk 1971). These include Hardaway Dalton points, Palmer corner-notched, Kirk corner-notched, Kirk stemmed, and bifurcate base points like Amos corner-notched and LeCroy. People of the Early Archaic also used end scrapers, sidescrapers, spokeshaves, drills, gravers, choppers, hammers, and anvil stones. During this period, a shift in raw material preference to non-cryptocrystalline stones like argillite occurred.

Several Early Archaic sites have been found on Staten Island and produced projectile points like those mentioned above. The earliest of these sites are Richmond Hill, near the center of Staten Island where a hearth was dated to 7410 BC $\pm$ 120 (I-4929), and Ward's Point, near Tottenville, dating to 6300 BC $\pm$ 140 (I-5331). These are among the earliest Archaic dates in the Northeast (Ritchie and Funk 1971).

The Middle Archaic period lasted from 6000 to 4000 BC. People of the Middle Archaic subsisted on chestnuts, acorns and anadromous fish, as well as the abundant forest animals. Oak, chestnut and hemlock dominated the landscape causing animal populations to increase in the forests because of the abundance of mast foods produced by the trees. Heavy woodworking tools, along with netsinkers, and fish remains found on archaeological sites suggest a riverine or estuarine adaptation (Kraft 1986:56). The climate was warm and moist by 5000 BC, and rising water levels forced groups to settle further inland.

People began to develop woodworking tools during the Middle Archaic using coarse-grained stones and river cobbles for their raw materials. These stones were commonly available in large sizes and allowed tool makers to reserve high quality lithic materials for finely flaked tools. New shaping

techniques were developed in order to work these coarse-grained rocks. The primary technique was pecking and grinding which was used for shaping axes, adzes, gouges, choppers and other woodworking or rough stone tools. These heavy woodworking tools may have been used for canoe building. In addition to these implements, the Middle Archaic tool kit included anvil stones, choppers, netsinkers and an array of projectile points. The most commonly used raw materials included chert, jasper, argillite, shale, and rhyolite. Neville points are found on Middle Archaic sites as well as Stanley Stemmed which are similar to Early Archaic Bifurcate Base points (Kraft 1986:58).

The environment during the Late Archaic (4000-2000 BC) was similar to that of today. Hunting, fishing, and gathering were still the principle daily activities although greater emphasis was placed on small game, shellfish, nuts and wild cereal grains like *chenopodium*. This shift in subsistence strategies made higher population densities possible. However, the larger population may have made it necessary to exploit these different resources. Whatever the reason, as population increased, camps became larger and more numerous. While principle settlements were located near major rivers, people still lived in bands whose territories may have been well-defined. Moving seasonally or when resources dwindled, Late Archaic groups probably congregated occasionally for exchange and socialization. Houses of this period may have been circular and oval measuring 36 to 66 feet (11 to 20 meters) in diameter with overlapping entranceways. One such house pattern was found at the Wapanucket No. 6 site in Massachusetts (Robbins 1960). The Lamoka Lake site in western New York contained rectangular house patterns 14 to 16 ft (4.3 to 4.9 m) long and 7 to 13 ft (2.1 to 4 m) wide (Ritchie and Funk 1973). A Late Archaic house pattern was found near Long Island Sound in a "gently-rising, wooded ground on the east side of a northward-flowing stream emptying into an estuary and thence into Long Island Sound" (Gwynne 1984:1). This pattern suggests a round or oval shape but size could not be determined (Gwynne 1984:6).

Heavy grinding implements like mullers, mortars and pestles provided new means of preparing food from seeds, nuts, dried berries and meat. These implements were made of sedimentary and metamorphic rock like sandstone and argillite. Late Archaic people also used bifacial, chipped-stone knives, semilunar knives which were often made of slate, the atlatl or spear thrower, bolas, and plummets. Traces of the Laurentian tradition, a Late Archaic culture which is characterized by ground slate ulus, plummets, and gouges, are found on some coastal New York sites including the Stony Brook site. Long, narrow-stemmed or narrow, weakly notched projectile points like Poplar Island, Bare Island, Lackawaxen-stemmed, and Normanskill were characteristic of the Piedmont or Small Stemmed Tradition, which originated in the Southeast (Kraft 1986:73). These projectile points were not often reworked into scrapers, drills and gravers because of their size and shape. Narrow-stemmed projectile points were found at the Bowmans Brook site on Staten Island.

A major component of the Late Archaic Piedmont Tradition, the Sylvan Lake complex, was found at the Wading River Site on Long Island. Sylvan Stemmed points were a part of the Sylvan Lake complex which dates to 2500 BC. Features of this culture include the use of small-stemmed points and atlatls for hunting. Flintworking, butchering, and woodworking were other common activities of Sylvan Lake people.

Nut-bearing trees like oak, hickory, chestnut, and beech dominated the eastern forests during the Terminal Archaic (2000-1000 BC). Sea levels continued to rise causing increased salinity in estuaries, including the lower Hudson River (Kraft 1986; Snow 1980). People of this period subsisted on deer, black bears, small mammals, wild turkeys, pigeons, shellfish, fruits, roots, nuts, and anadromous fish.

Large, broad-bladed, skillfully made spearpoints of the Susquehanna broadspear tradition began to appear on archaeological sites from this period and were spread along the Atlantic coast from Georgia to Maine. According to Kraft, this tradition probably originated in the southern Piedmont and was related to the Koens-Crispin culture (Kraft 1986:84). The Koens-Crispin culture is represented by broad-stemmed points, scrapers, atlatl weights, celts and adzes. Koens-Crispin points are similar to Savannah River, Lehigh Broad, and Snook Kill points which implies widespread travel and trade among Terminal Archaic people. According to Mounier, "The complex is associated with an elaborate pattern of mortuary ceremonialism which emphasized the practice of cremation, the ritual use of red ocher, and the often lavish inclusion of grave goods" (Kraft and Mounier 1982:82). The Koens-Crispin site in Medford, New Jersey, and the Savich Farm Site in Marlton, New Jersey, both revealed such practices. The Savich Farm Site dates between 1900 BC and 2300 BC. (Kraft 1986:80). The Snook Kill phase is an early part of the Susquehanna tradition and is characterized by broad-bladed, contracting-stemmed points. Another innovation was steatite or soapstone pots which facilitated cooking and food preparation.

Woodland Period. The introduction of pottery marks the beginning of the Woodland period. Pottery is significant because it "improved the efficiency of food preparation" (Curtin 1996:6). Several different cultures can be recognized in the Early Woodland period which lasted from 1000 BC to 1 BC. Orient Fishtail points replaced the broadspears of the Terminal Archaic during the Orient phase. These points were used as knives and spears, and were reworked into drills, scrapers, strike-a-lights, and gravers (Kraft 1986:91-92). Orient people still used soapstone pots but also used clay pots tempered with crushed steatite. These pots, called Marcey Creek Plain, were similar in shape to steatite pots. Another early type of ceramic was Vinette-1 which was cone-shaped with cord-marked impressions on the inside and outside. The Orient culture is named for the Orient sites on northeastern Long Island. These sites were complex burial sites with large communal pits on top of hills and some individual burials. Many of the burials were accompanied by Orient Fishtail points, soapstone fragments or "killed" soapstone pots, and red ochre. "The typical grave lot therefore provided for hunting game, kindling fire, and cooking food, with a cosmetic kit thrown in" (Ritchie 1980:177). According to Smith, the Orient culture was "the burial complex of the people responsible for the North Beach focus" on Long Island (Smith 1950:150). Orient sites have been found all over Long Island, in upper New York City, on Staten Island, and in the Hudson Valley (Ritchie 1980:165).

The Middle Woodland period lasted from AD 100-900 and was characterized in coastal New York by the Windsor Northbeach focus (or phase) and then the Windsor Clearview focus which overlapped the former. The Clearview focus preceded the Bowmans Brook phase on western Long Island and Manhattan Island (Ritchie 1980; Ritchie and Funk 1973).

The Windsor Clearview phase was followed in the Late Woodland period by the Windsor Sebonac focus. The Sebonac phase is characterized by relatively large villages of possibly a hundred inhabitants, located in areas rich in shellfish (Ritchie 1980:266). In addition to shellfish gathering, Sebonac people hunted, fished, and engaged in horticulture as evidenced by carbonized corn found at the Sebonac site on Long Island by Harrington (1924:249-253). Homes of this period were circular and 10 to 20 ft (3 to 6 m) in diameter.

Utilitarian artifacts of the Sebonac phase include broad, thin, triangular Levanna points often made of white quartz. Bone harpoons and fish hooks along with netsinkers were used for fishing. Woodworking tools like grooved and notched axes, celts, and plano-convex adzes were used (Ritchie 1980:267-268). Ritchie described the commonly shell-tempered Sebonac pots as elongated and cone-shaped at the base with a straight or inward-slanting collarless rim. The exterior surface was decorated by brushing with scallop shell or fabric but was sometimes cord-marked or plain. The interior was smoothed possibly with a scallop shell to create striations. Scallop shells were also used to decorate the area from the shoulder to the lip with linear, criss-crossed or rectangular designs that were combed or stamped. Occasionally, triangular or circular punctations occur with raised interior rim bosses (Ritchie 1980:268).

Non-utilitarian artifacts include stone pendants with holes drilled through the center or side, and sometimes with incised designs. Although bone and shell beads are found only rarely, stone and ceramic pipes are found, and the latter are decorated with stamped or incised designs.

Sebonac people buried their dead flexed or folded without grave goods in pits already in use for other purposes, such as cooking. Evidence for the use of charnel houses during this period is scant.

The Late Woodland is a period of significant cultural change. During this period, the subsistence system shifted its emphasis from gathering wild foods to growing domesticated plants. This change was made possible sometime between AD 500 and 1000 by the development of Northern Flint corn, which is a cold-resistant strain that diffused broadly after its first appearance, probably in the Midwest (Fritz 1990). According to Cassedy et al. (1993), early maize cultivation began about AD 900 in the mid-Hudson drainage. Corn associations with radiocarbon mean dates between AD 850-950 are also reported from coastal Connecticut and the Susquehanna and Hudson drainages (Cassedy et al. 1993). Maize from the Bowmans Brook Site on Staten Island was dated to 390+60 BP (Beta 15769) or AD 1270-1410 (Ceci 1990). Information from a variety of sources consistently documents the presence of corn in the Long Island Sound region with a large number of radiocarbon dates before European contact (Cassedy et al. 1993).

The introduction of corn horticulture was accompanied by settled village life, population growth, an enriched religious and ceremonial life, and warfare among some cultures, such as the Iroquois in upstate New York (Bender and Curtin 1990; Cronon 1984; Handsman 1980; Kraft 1986). Some interesting mortuary practices began to occur during the Late Woodland involving dog ceremonialism. According to Strong (1985:36), two themes can be seen. One, which dates back to the Late Archaic, involves the dog's relationship to "home and hearth" as reflected by dog

burials found in villages near hearths. Strong speculates that dogs may have been sacrificed to protect the household. The second theme, which is more prevalent in the Late Woodland, is the burial of dogs in association with humans. It is possible that age, sex, and cause of death of humans were factors in dog sacrifice. Dog burials have been found on sites occupied during the Bowmans Brook phase of the East River Tradition in the early Late Woodland.

Bowmans Brook sites are found along "tidal streams or coves" (Ritchie 1980:269) and often contain pits filled with shell. Shellfish gathering was an important activity along with fishing, horticulture and hunting. Utilitarian artifacts include broad triangular Levanna points made of quartz or other stone, antler and bone-flaking tools, netsinkers, bone awls, hammerstones, anvils, grooved axes, abrading stones, tools made of beaver incisors, and ceramics.

Ritchie believes the Bowmans Brook culture entered coastal New York from New Jersey. Bowmans Brook incised pottery was found at the Abbott Farm Site on the Delaware River in New Jersey. Bowmans Brook Stamped pots are tempered with grit and have an elongated body, cone-shaped base, a "straight or flaring rim, and cord-malleated exterior and smooth interior surfaces, and cord-wrapped stick decorations in simple linear, chiefly horizontal, patterns" (Smith 1950: 191-192). Bowmans Brook Incised pots are sometimes shell-tempered with an in-sloping rim and a mostly smooth exterior surface. The rim is decorated with triangular or rectangular incising. "The herringbone motif is common and a few vessels of this type have stylized human faces formed by three punctates placed on raised nodes about the rim" (Ritchie 1980:270). East River Cord Marked pottery is a third type common to this culture. It is elongated with a cone-shaped base like the other two types but the exterior surface is cord-marked and sometimes smoothed over.

Non-utilitarian artifacts include "a bone pin with a carved head, a fragmentary rectangular pendant, and a hematite paintstone" (Ritchie 1980:269). Cut and drilled deer bones may have been ornaments worn on clothing, while plain or stamped ceramic pipes have been found on a few sites.

Bowmans Brook people buried their dead flexed or folded without grave goods in pits already in use for other purposes, such as cooking, or in a cemetery near the village. Bundle burials and dog burials have also been found as noted above.

The Bowmans Brook phase was succeeded by the Clasons Point phase of the East River Tradition. Dating about AD 1300, Clasons Point sites are usually located on terraces above tidal inlets and often contain numerous pits used for cooking, storage, trash disposal, and graves. Clasons Point people buried their dead flexed in storage pits or in a shallow grave. Shellfish remains are found in very high frequencies on these sites while the remains of other animals are found much less frequently. People of this culture also engaged in gathering and horticulture as evidenced by the presence of corn, hickory nuts, walnuts, and sweet-flag roots (Ritchie 1980:271).

Clasons Point people continued to use Levanna points but also began using antler and bone projectile points. According to Ritchie, "a long-bone dagger with serrated edges occurred on one of the sites" (Ritchie 1980:271). Netsinkers were used in fishing as well as bone hooks. Stone hoes, mortars and pestles, mullers, and turtle shell dishes have been found. Wood-processing tools

in the form of three-quarter grooved axes, celts, antler-tine wedges, beaver incisor scrapers, gravers and chisels, and flake scrapers were used. Triangular, stemmed, and lanceolate stone knives were used along with drills, nutting stones, hammerstones, anvilstones, sinewstones, bone awls, perforated mat needles, and antler tool handles (Ritchie 1980:271).

Ceramics of this period were characteristically one-to-two-gallon vessels with the same shape as the types mentioned above, and mostly shell tempered with straight or flaring rims and exterior cord-impressed decoration. Vessels from the latter part of the period became more globular with rounded bases and collared rims that have been turned out. The body is smooth or cord-marked and the rim and collar are incised. One such type, Van Cortland Stamped, is similar to the Owasco Corded Collar type found to the north. Eastern Incised, which has an incised collar, is similar to Chance Incised and Deowongo Incised Iroquoian types.

Non-utilitarian artifacts include stamped or incised elbow-shaped clay pipes, bone beads, shell beads, and wampum beads, which, according to Ritchie, were "a European-trade-inspired commodity" (Ritchie 1980:271). However, Ceci (1990:23) suggested that wampum or proto-wampum played an important role in the development of sedentary or semi-sedentary villages and in trade between villages and large centers in the Midwest before European contact. "The decline of midwestern centers led to a breakdown of exchange systems in the Northeast ca. AD 1400" (Ceci 1990:23). According to Ceci, the exchange system was then reactivated around AD 1550-1600 when the first Europeans arrived. Moreover, "native cultural development continued for over a half century after the arrival of Europeans and the same factors that drew the American Indian to the mouth of the Hudson also attracted the Dutch" (Schuyler 1977:1).

Sociopolitical aspects of the Clasons Point Phase peoples included the speaking of Algonkian languages and belonging to the Metoac Confederacy. The Canarsie and the Rockaway, located in western Long Island, were among this affiliation's thirteen subgroups. The Canarsie primarily occupied lands in King's County, while the Rockaway did likewise in Queen's County (Black 1981:8). Significant sites with documented artifacts include the Canarsie, Winnipague and Ryders Pond for the Canarsie natives and the Aqueduct site for the Rockaway Indians (Bolton 1934; Black 1981:7-10). All of these sites have been destroyed by subsequent construction. These two groups also lost outright ownership or use of this area to the Dutch beginning in 1636 with the process virtually complete by 1667—some thirty years (Black 1981:7,10,12).

Prehistoric Sites. The topography and physiography of most portions of the Rockaway peninsula have undergone substantial alterations due to twentieth century development. However, none of the compendia and maps showing prehistoric sites in the New York City area published early in the twentieth century (e.g., Bolton 1922, 1934; Parker 1922) show any sites within or in the vicinity of the project area. The files of the New York State Museum (NYSM) likewise do not indicate the presence of sites in this area. The nearest sites included in the NYSM files are a camp site on high ground adjacent to the Jamaica Bay marshes in Inwood (NYSM 4050) and a village site and shell midden (NYSM 4033) adjacent to Bannister Creek in Cedarhurst. These sites are approximately three miles northeast of the project area.

Closer to the project area, sites were reported in the Bayswater portion of the Rockaway peninsula in the early twentieth century. One source noted "prehistoric relics and . . . seven giant Indian skeletons, recently found in Bayswater . . . in the vicinity of the Bayswater Hotel and golf grounds probably on the hill where the golf club house stands" (Pettit 1901:5). Bellot also reported extensive shell deposits at Bayswater "on Judge Healy's property [which however had been] carted away and used for filling in purposes and road making" (Bellot 1918:90). Late-nineteenth century maps show that these sites were located on higher ground overlooking the Jamaica Bay marshes approximately 5,500 and 3,500 ft (1,678 and 1,068 m) north of the project site, respectively. A 1988 cultural resources study reported that a local collector, Steve Feldman, mentioned that "the extreme eastern shore of Jamaica Bay (Bayswater) is still yielding Woodland Period ceramics, projectile points, and a possible burial" (Historical Perspectives 1988:12). While the location of these latter finds was not specified, it is possible that they are derived from the remains of the site(s) noted in the early twentieth century sources noted above.

More significant than their distance from the project area is the fact that the reported sites were located in a very different environment. These sites were located on the more sheltered Jamaica Bay side of the peninsula on higher ground overlooking marsh areas, which would have represented a source of shellfish, waterfowl and other subsistence resources. Proposed T-groin construction will occur in an area that includes an active beach and the immediate offshore zone. These areas are subject to continuous wave action and reworking of surficial material as a result of the processes discussed above in Section 2.1. Consequently, *in situ* prehistoric archaeological deposits dating to the period after the barrier beach reached its present location would not be expected to be located here. Kopper concluded that

> in such an environment, surface and underwater accumulations of artifacts, shells and other food debris, and even small features of human manufacture tend to become buried rapidly then re-exposed and dispersed or destroyed under the action of storm waves. . . . It is obvious [that the] . . .very high energy levels [produced by storm waves] are capable of dispersing or destroying the relatively fragile remains of prehistoric activity exposed underwater or above water on open storm beaches [such as] Rockaway Beach. [1979:4].

Kopper goes on to note that "It is possible that...important historic or prehistoric cultural resources lie buried in the sand and have never been exposed. Location of such resources would require geophysical equipment such as magnetometers" (1979:5).

Documentary studies and field surveys of other portions of the Long Island barrier island chain report the absence of recorded prehistoric sites and the limited presence of artifact finds. No prehistoric sites, for example, were noted in Pickman's 1990 and 1993 documentary investigations for Coney Island and Long Beach, as did Kopper (1979) for East Rockaway Beach. His investigation, in addition to archival research, involved a surface and subsurface survey along the beach/shoreline of East Rockaway Inlet which, according to his Figure 3, included the present project area. Kopper notes that only modern materials and one area of weathered planks with hand-wrought spikes were found during the survey. Two studies that recovered prehistoric material, both from Fire Island, are those of Vetter and Salwen (1975) and Linck (1981, cited in

Bouchard and Hartgen 1985). In Vetter and Salwen's Phase IA/B investigation, the project area was divided into eight sampling zones based on landform criteria. The authors considered the barrier island to possess a low probability for prehistoric resources, although they did recover a broad-edged quartz knife from a land fill area (with consequent loss of its original context). Linck reports scattered indications of prehistoric activity, including three worked quartz fragments from a disturbed context at the William Floyd estate; two prehistoric sherds apparently encountered in shovel tests; and the presence of a small scatter of chert flakes and calcined bone at the mouth of Home Creek.

During the late prehistoric and contact periods, after the formation of the barrier islands, inhabitants of the surrounding mainland most likely would have exploited the islands for their marine food resources. The artifacts recovered on Fire Island, an area of less disturbance than the Nassau County or New York City portions of the barrier island chain, may represent the remains of campsites associated with these activities (see this section, prehistory review). Despite the resource potential of the region and the presence of artifacts, the exposed barrier islands were probably utilized as short-term extract sites rather than as permanent or semi-permanent settlement locations. The landforms associated with the recovery of the artifacts in the Linck study are unclear and may have come from behind the dune line; the quartz knife noted in the Vetter and Salwen (1975:9) investigation was recovered from the west end of the Smith Point County Park (now the Great South Beach), but its position relative to the beach and dunes is also unclear. Because of natural processes operating within active beach zones, it is unlikely or of low probability that intact or even partially intact prehistoric sites would be located south of the dune line.

Contact Period. When Europeans first settled western Long Island in the early-seventeenth century, several Native American groups, apparently speakers of the Algonquian language, lived on the island. The Rockaway, who occupied Nassau County and the eastern portions of Queens County, most likely would have controlled at least the eastern portion of the Rockaway Peninsula (Trelease 1960) (Figure 6). Thompson (1962 [1918]) stated that the Rockaway had a large settlement on Hog Island in Rockaway Bay (present-day Hempstead Bay), immediately north of Long Beach. Munsell (1882) also noted the presence of a large shell heap on this island and Parker (1922) included this site in his compendium. Bellot (1918:9) asserted that the main Rockaway village was located on Hog Island, also known as Barnum's Island. This location should not be confused with the outer beach at Rockaway, which was also known as Hog Island in the late-nineteenth and early-twentieth centuries.

Early Historic Period. In 1685 the Rockaway deeded a large tract of land that included all of the Rockaway peninsula extending westward from the present Wave Crest area to European speculators. This tract was subsequently granted by English Governor Thomas Dongan to John Palmer, who sold this land in 1687 to Richard Cornell (also named in the records as "Cornwell" or "Cornwall"). "[A]n ironmaster of Flushing," Richard Cornell is generally considered the first settler in the Rockaway area. His house was erected at Far Rockaway, east of the project area. Upon Cornell's death in 1693, his land was divided among his heirs (Bellot 1918:9-21).

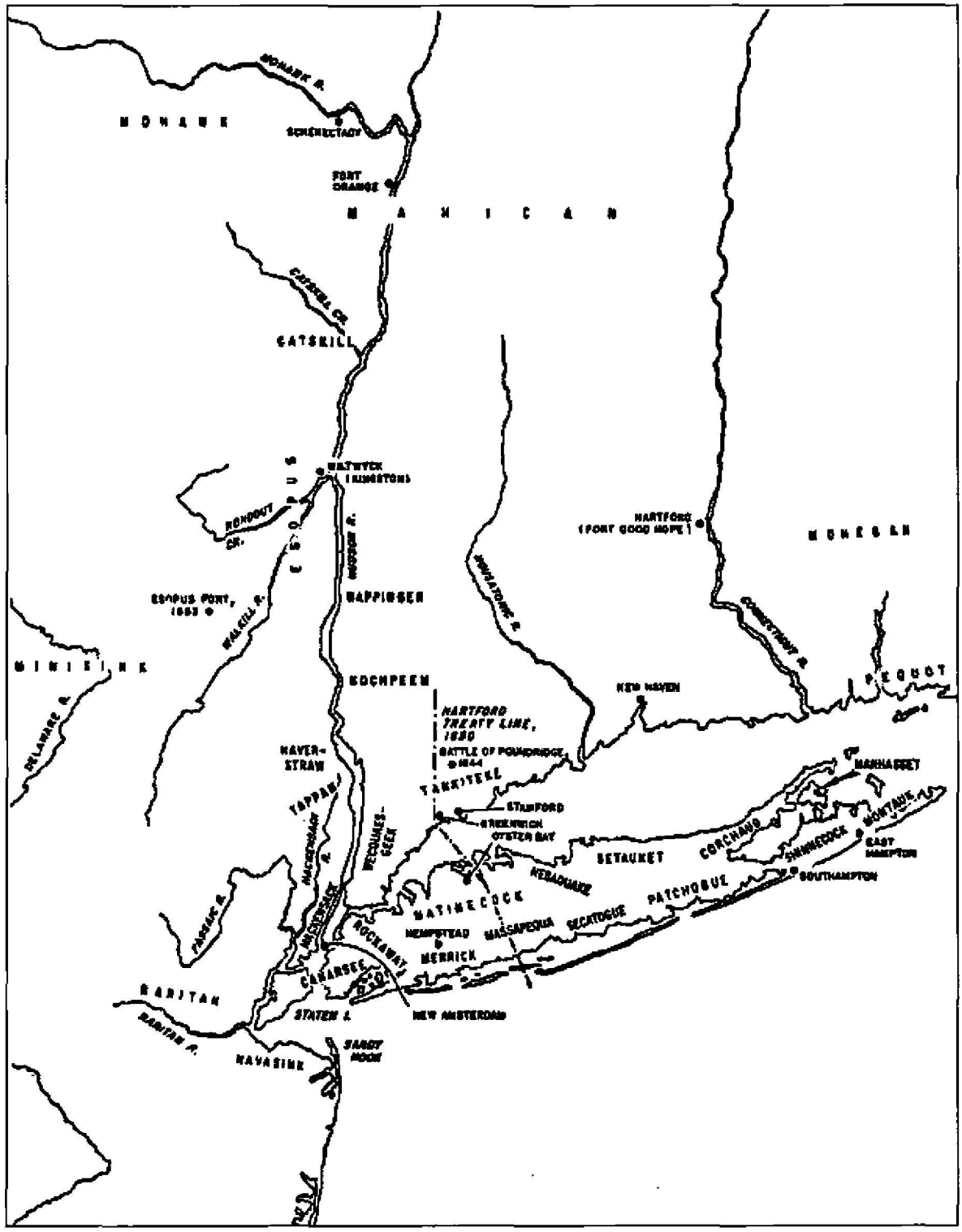


Figure 6. Location of Native American groups in eastern New York, New Jersey, and Connecticut during the Contact Period. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Trelease 1960:6).*

In 1809, as a result of a petition by descendants of the original Cornell heirs, the Rockaway peninsula was divided into two portions, with the eastern section of the beach within the second division and subdivided into 15 separate plots. By the mid-nineteenth century, nearly all of the eastern division, including the project area, was owned by John L. Norton. With Norton's death in 1848, his heirs sold much of his land to Samuel L.B. Norton, Henry Mott and others. The Edgemere section was part of a tract that eventually came into the possession of the three sons of Samuel Norton. The Nortons and others eventually subdivided the property, built streets and erected a number of "handsome cottages for sale to wealthy New York people" (Bellot 1918:9-21).

Despite numerous land transactions, no structures were erected in the vicinity of the project area beach until late in the nineteenth century. Maps drawn from the late-seventeenth century through the early-nineteenth century illustrated Rockaway as a barren stretch of land (Figures 7, 8 and 9) with no structures depicted along the beach west of Far Rockaway (where the Marine Pavilion stood in the early-nineteenth century. The Walling map (Figure 10) shows four such structures by 1859. The easternmost structure is labeled "L. Dodge"; the Lewis R. Dodge homestead at Rockaway Boulevard and Dodge Avenue was torn down in 1918 (Works Progress Administration 1938 I:177). Dodge Avenue is shown on early-twentieth century maps well to the west of the project area, in the vicinity of the present Hammels section of Rockaway. At that time Rockaway was within the limits of the Town of Hempstead. Later, this area was included within New York City's Queens Borough when the latter was created in 1899 (Seyfried 1966:Part 5).

The only structure depicted along the beach on the 1879 coastal survey map (Figure 11) is the Life Saving Station located west of the project area in what is now the Arverne section of the beach (see Figure 1). Despite improved access to Rockaway Beach with the construction of a wooden railroad trestle over Jamaica Bay in 1880 (Hazelton 1925), no structures are depicted along the beach east of the Life Saving Station on the1886 Beers map (Figure 12).

Late-Nineteenth and Twentieth Centuries. The Edgemere section of Rockaway was developed by Frederick J. Lancaster, beginning in 1892. Among the first buildings constructed was the Edgemere Hotel (also referred to as the Edgemere Club). The hotel, which opened in 1894, "was equipped and furnished on a lavish scale" (Bellot 1918:96). In 1901 Pettit described Edgemere as

> a fashionable summer resort that has recently come into prominence through the construction of the magnificent hotel of that name, which is directly on the ocean, at the head of the Inlet, with its rear to the bay. 'The Edgemere,' in its unique position, is one of the most aristocratic hotels on the Atlantic Coast [Pettit 1901:12]).

A turn-of-the-century description of the hotel noted that it

> follows the Renaissance style of architecture, is six stories in height, and covers something over an acre of ground. The hotel is fitted throughout with all modern conveniences, including steam heat, electric lights, electric elevators, and electric bells in every room [Album Publishing Co. 1902-1903].

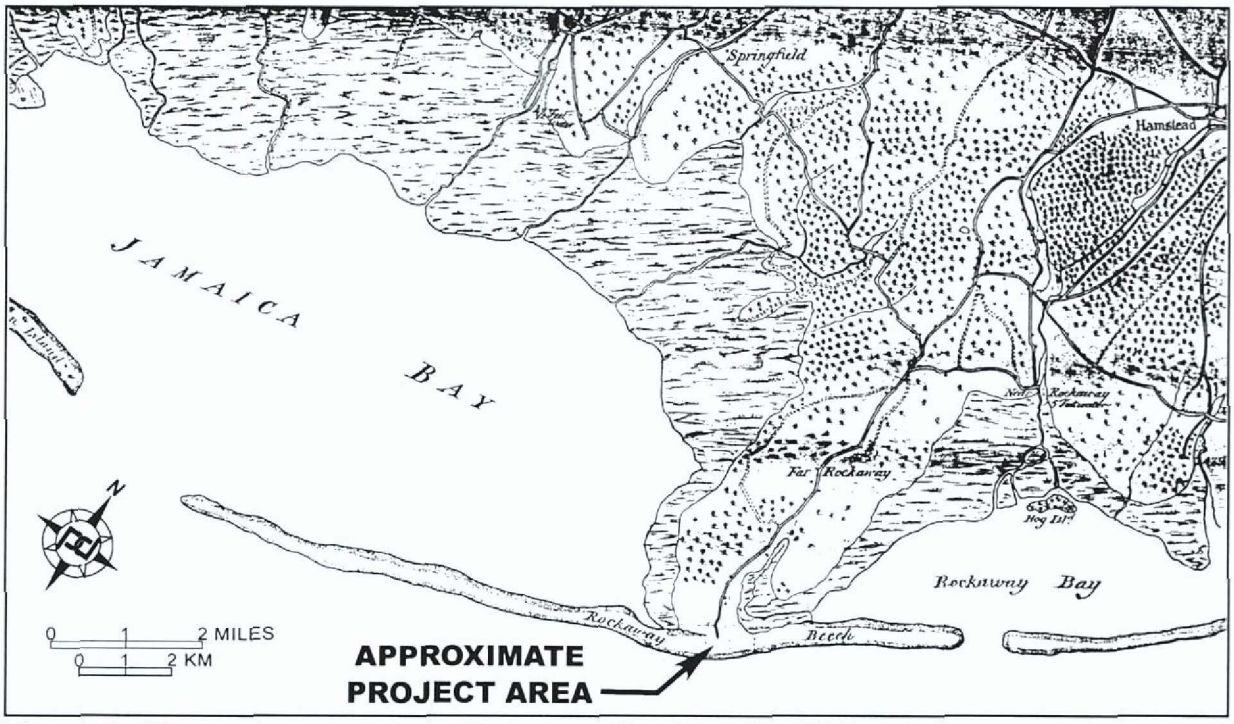


Figure 7. The project area along Rockaway Bay in 1781. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Taylor and Skinner 1781).*

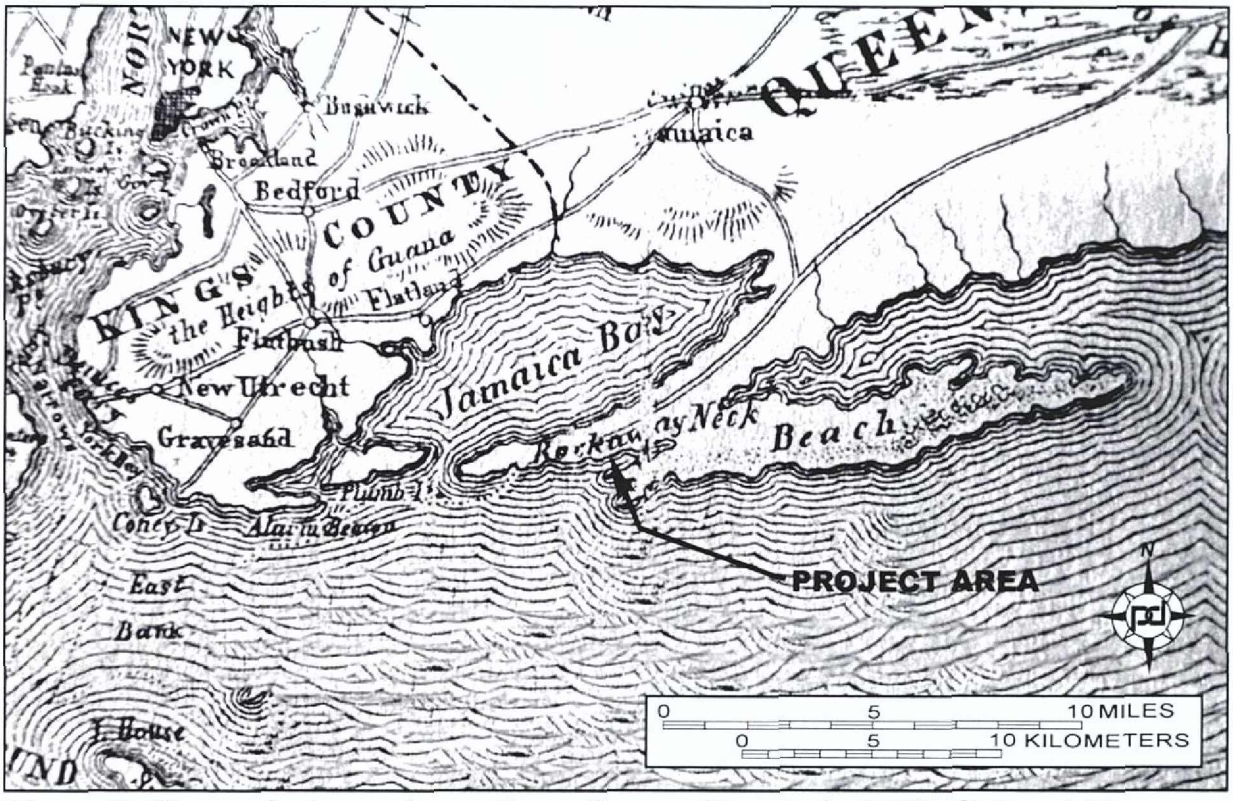


Figure 8. The project area in southern Queens County in 1779. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sauthier 1779*).

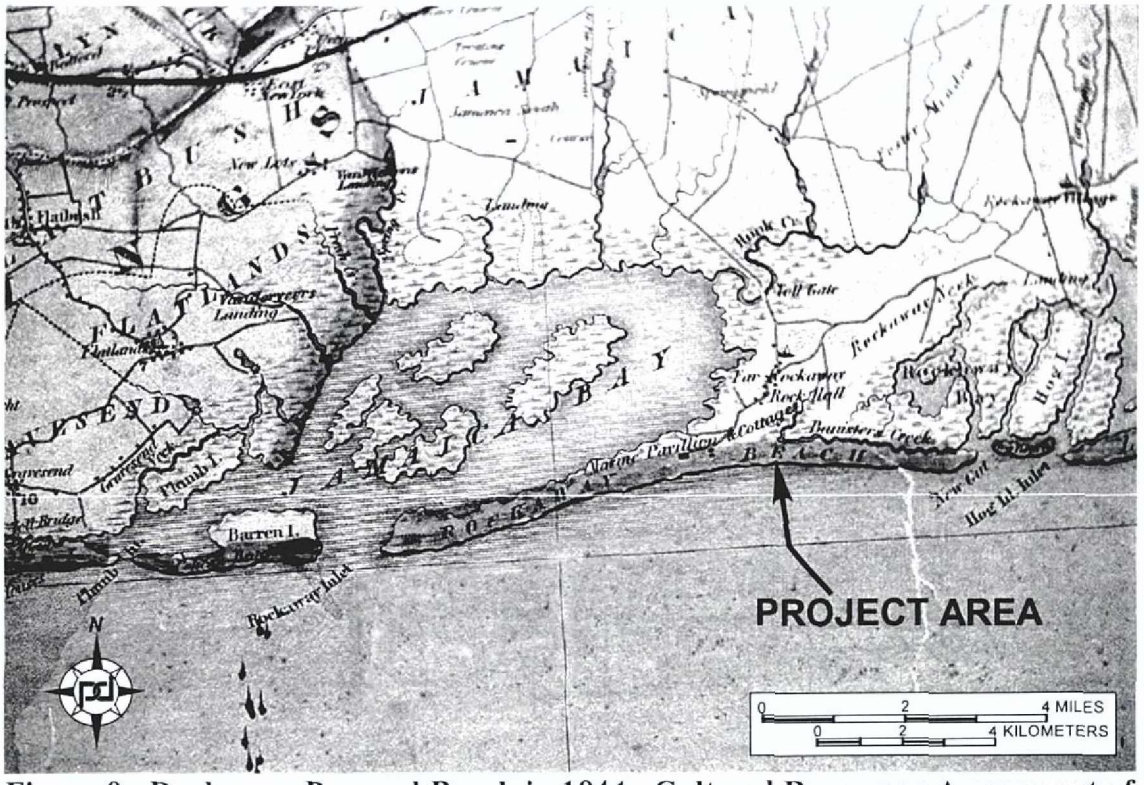


Figure 9. Rockaway Bay and Beach in 1844. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Walling 1859*).

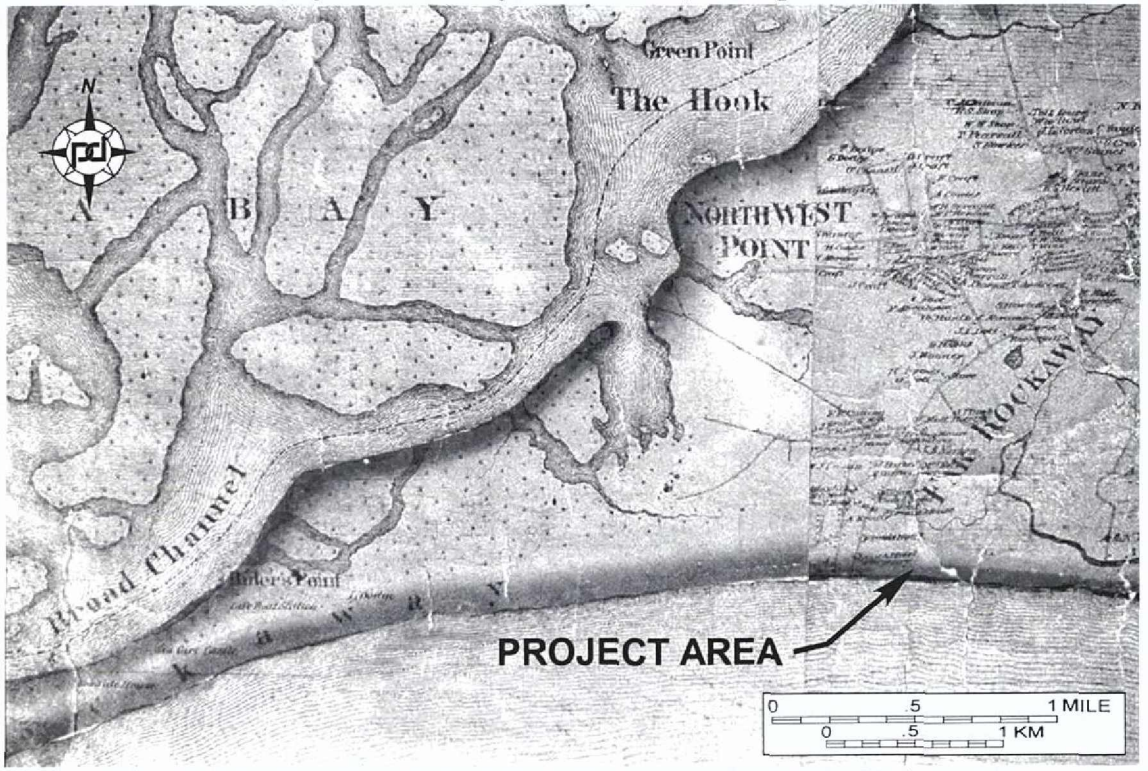


Figure 10. Rockaway Beach and Far Rockaway in 1859. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Walling 1859*).

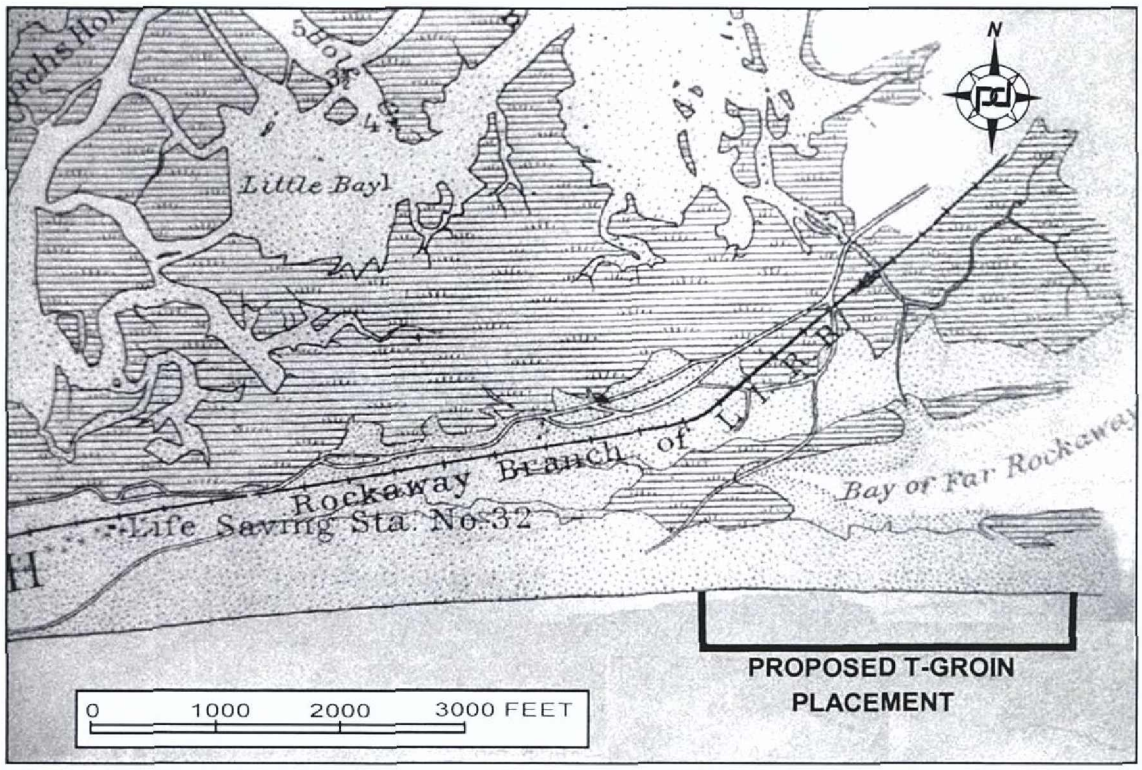


Figure 11. Bay of Far Rockaway in 1879. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*U.S. Coast and Geodetic Survey 1879*).

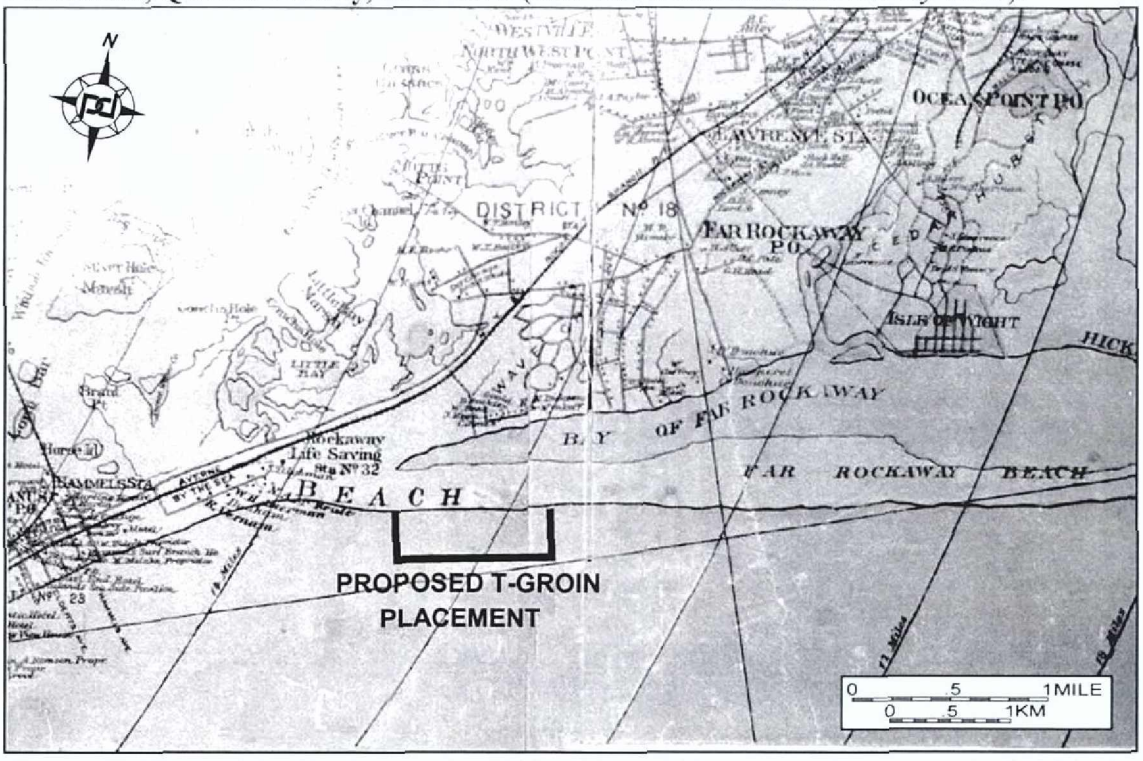


Figure 12. Bay of Far Rockaway in 1886. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Beers 1886*).

The grounds of the hotel included lawn tennis and croquet courts. Indoor recreation facilities included tennis and squash courts, and "hydropathic baths including hot and cold water baths and a heated swimming tank." The hotel eventually had both a stable for horses and a garage for automobiles (Gloeggler 1983a). The hotel is the only building shown in Edgemere in 1897 (Figure 13). The Lifesaving station was located west of Edgemere.

Depicted on the 1901 Hyde map (Figure 14), and in greater detail on the Sanborn map of the same year (Figure 15), the Edgemere Hotel was located between Grandview and Beach avenues, as shown on these maps, which correspond to present-day Beach 35th and 36th streets (see Table 1).

Analysis of later maps reveals that the hotel stood north of the present boardwalk location. In 1901 the Edgemere Hotel was the only structure along the beach in the project area, although several residential structures had been built to the north.

Table 1. Early-Twentieth Century and Present-day Street Names in the Project Area

Former Name	Present Name
Seagate Avenue	Beach 39th Street
Neptune Avenue	Beach 38th Street
Ocean Avenue	Beach 37th Street
Beach Avenue	Beach 36th Street
Grandview Avenue	Beach 35th Street
Surf Avenue	Beach 34th Street
Wave Crest Avenue	Beach 33rd Street
Rochester Avenue	Beach 32nd Street
Columbus Avenue	Beach 31st Street
Hudson Avenue	Beach 30th Street
Dickerson Avenue	Beach 29th Street
Maple Avenue	Beach 28th Street
Harriman Avenue	Beach 27th Street

The easternmost street laid out along the beach in 1901 was Wave Crest Avenue (present-day Beach 33rd Street. No development of the beach area is shown between this point and the inlet that had broken through the outer beach in the vicinity of the present Beach 19th Street (see Figure 14). By 1909 only two bath houses had been erected in the project area east of the Edgemere Hotel, one east and one west of Rochester Avenue (Beach 32nd Street) (Figure 16).

By 1912 substantial development had occurred along the project area shoreline as shown on the Sanborn map of that year (Figures 17a-c). If the 1909 Bromley map (see Figure 16) is accurate, all of this development would have occurred during the three-years between 1909 and 1912. It should be noted that the shoreline shown on the 1909 map is much farther south than that indicated on the shoreline change map (Figure 18), and Bromley, although dated 1909, might have reflected the shoreline and structures as they existed some years earlier.

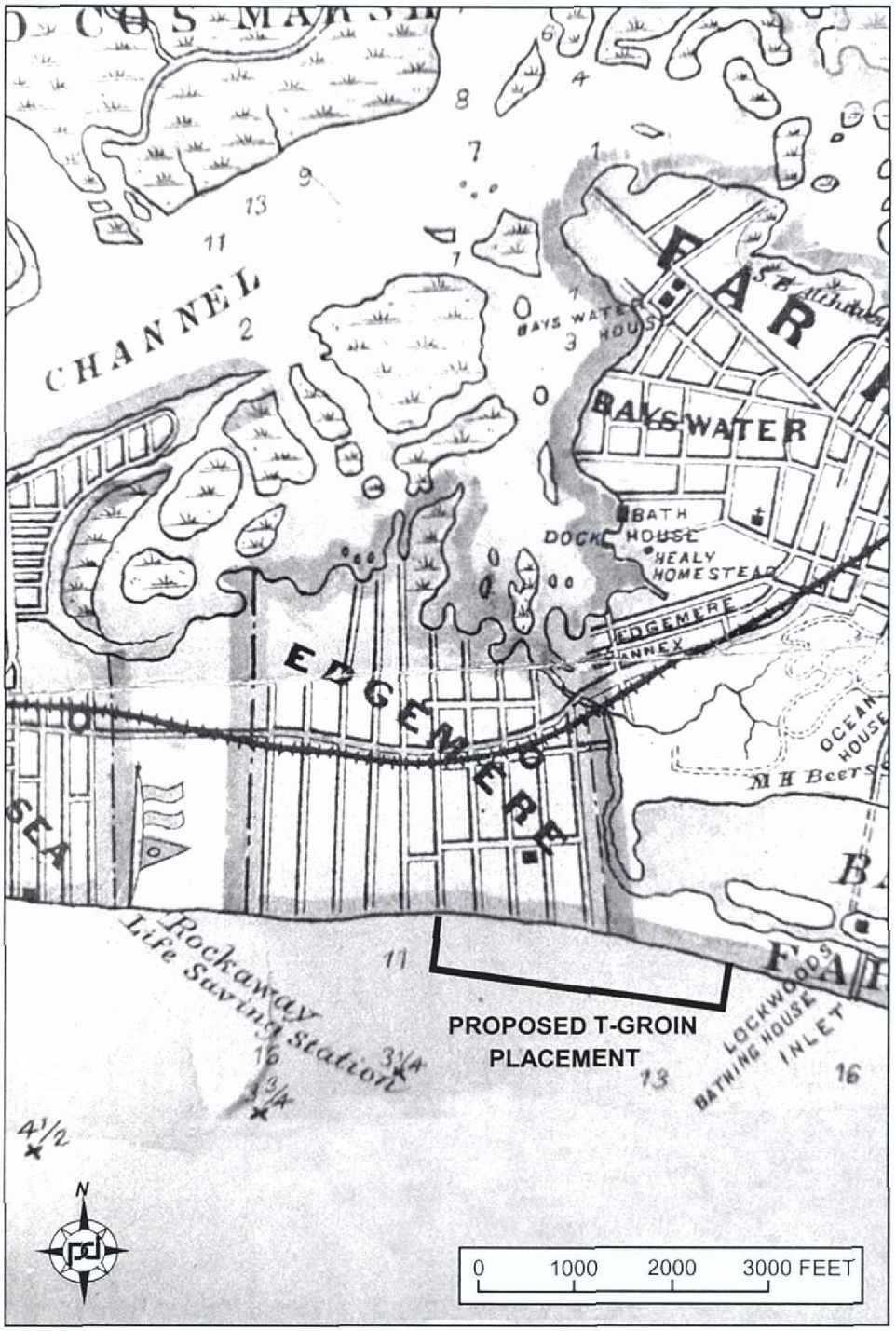


Figure 13. The Edgemere section of Queens County in 1897. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Hyde 1897*).

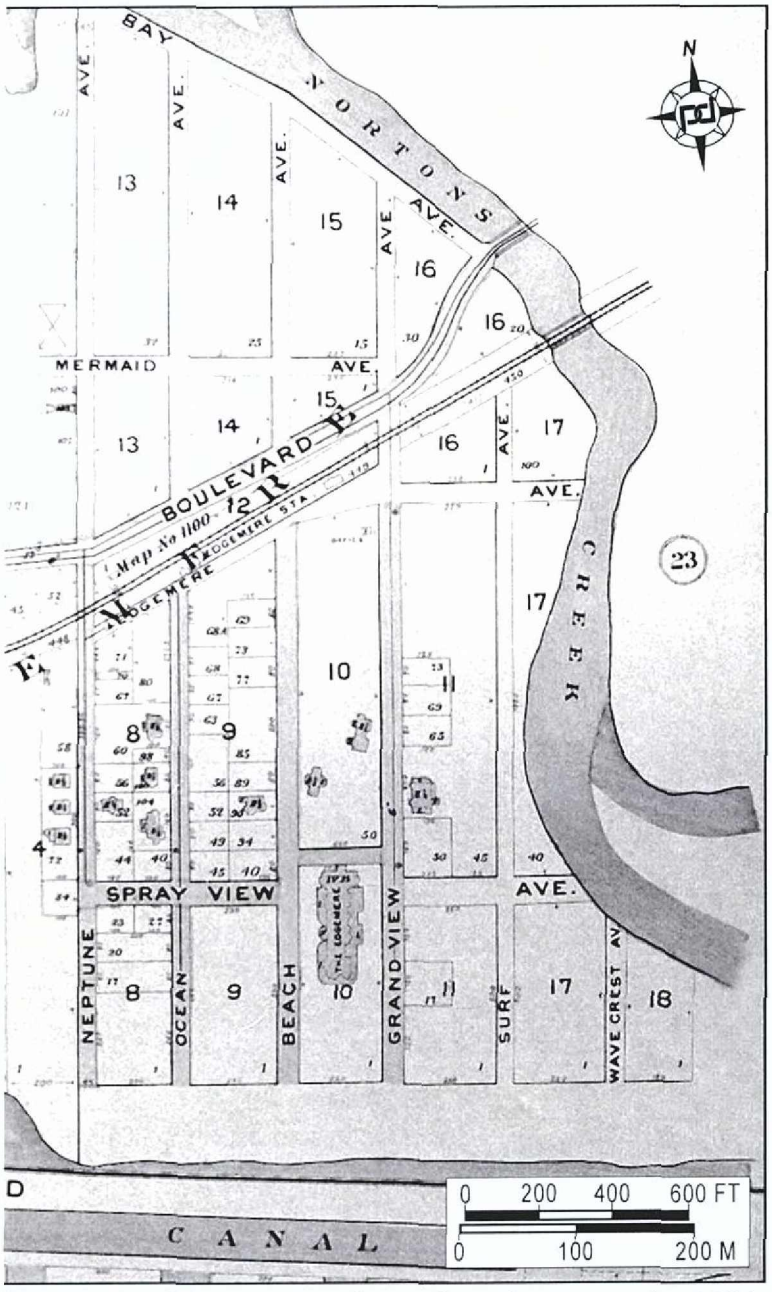


Figure 14. Western section of project area in 1901. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Hyde 1901:I:24*)

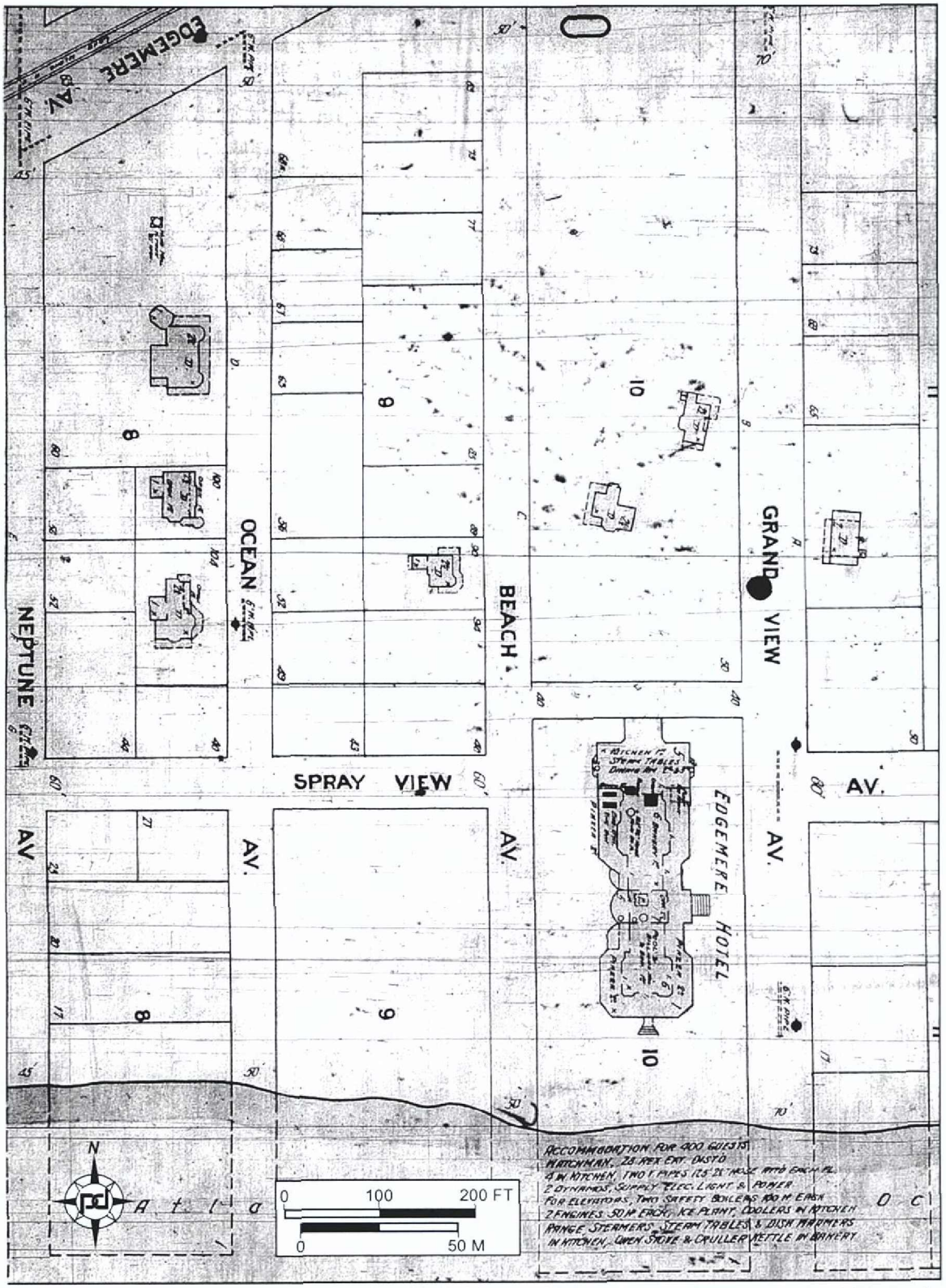


Figure 15. The Edgemere Hotel in 1901. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1901*)

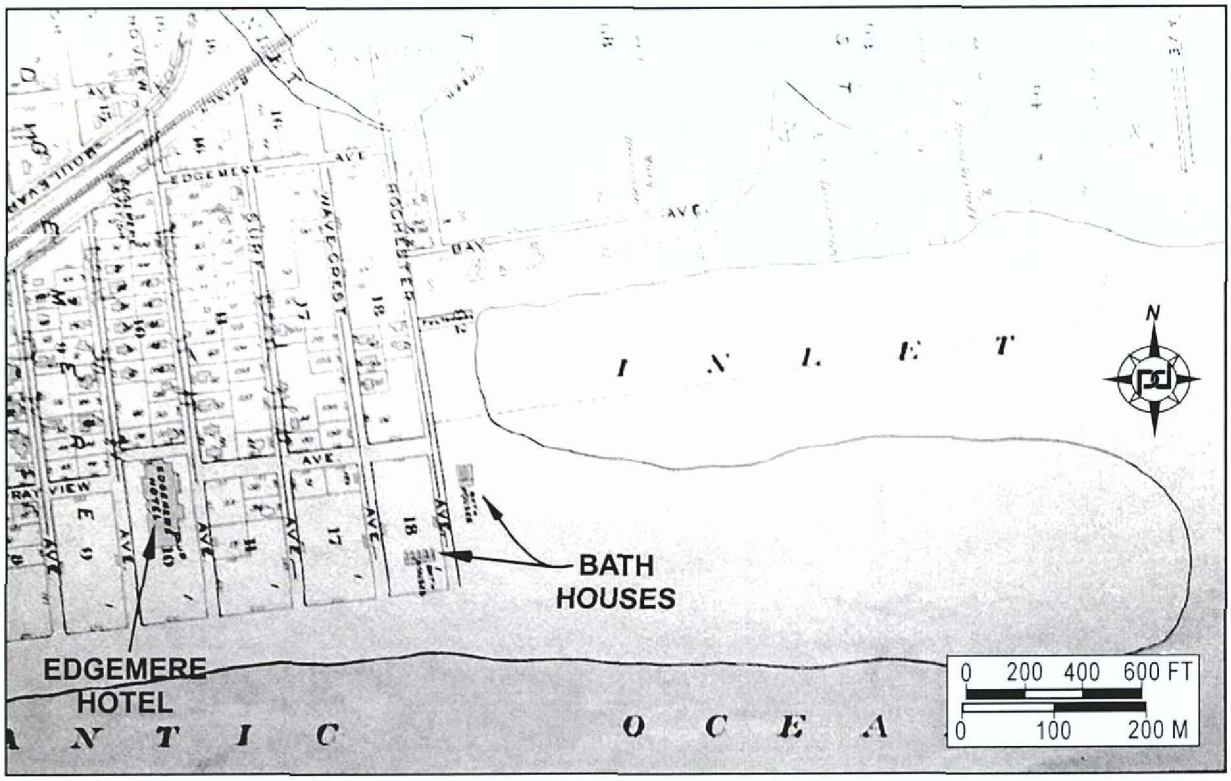


Figure 16. The eastern portion of the project area in 1909. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Bromley 1909:45*).

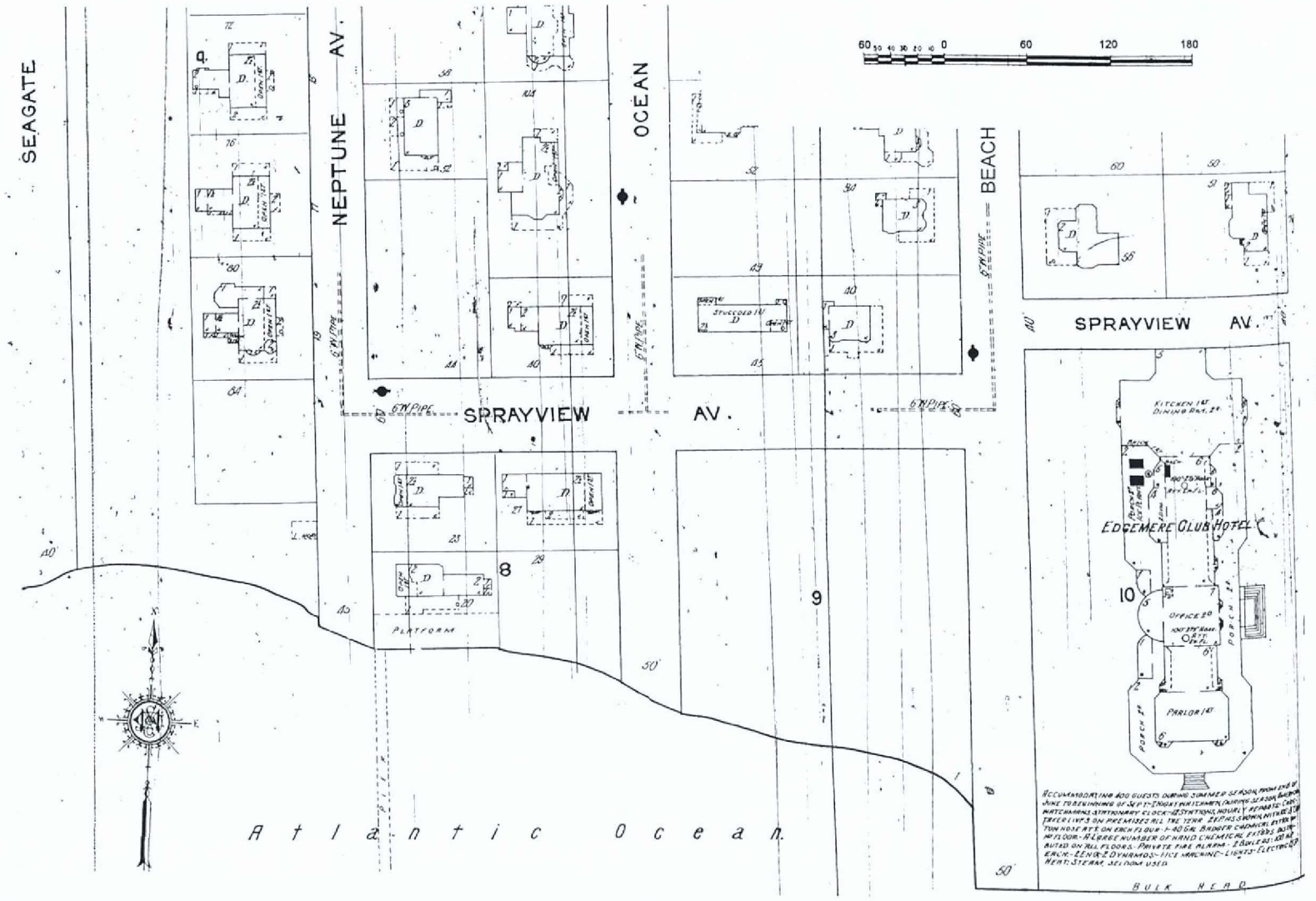


Figure 17a. Structures and streets in the project area in 1912. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1912: 8:45*)

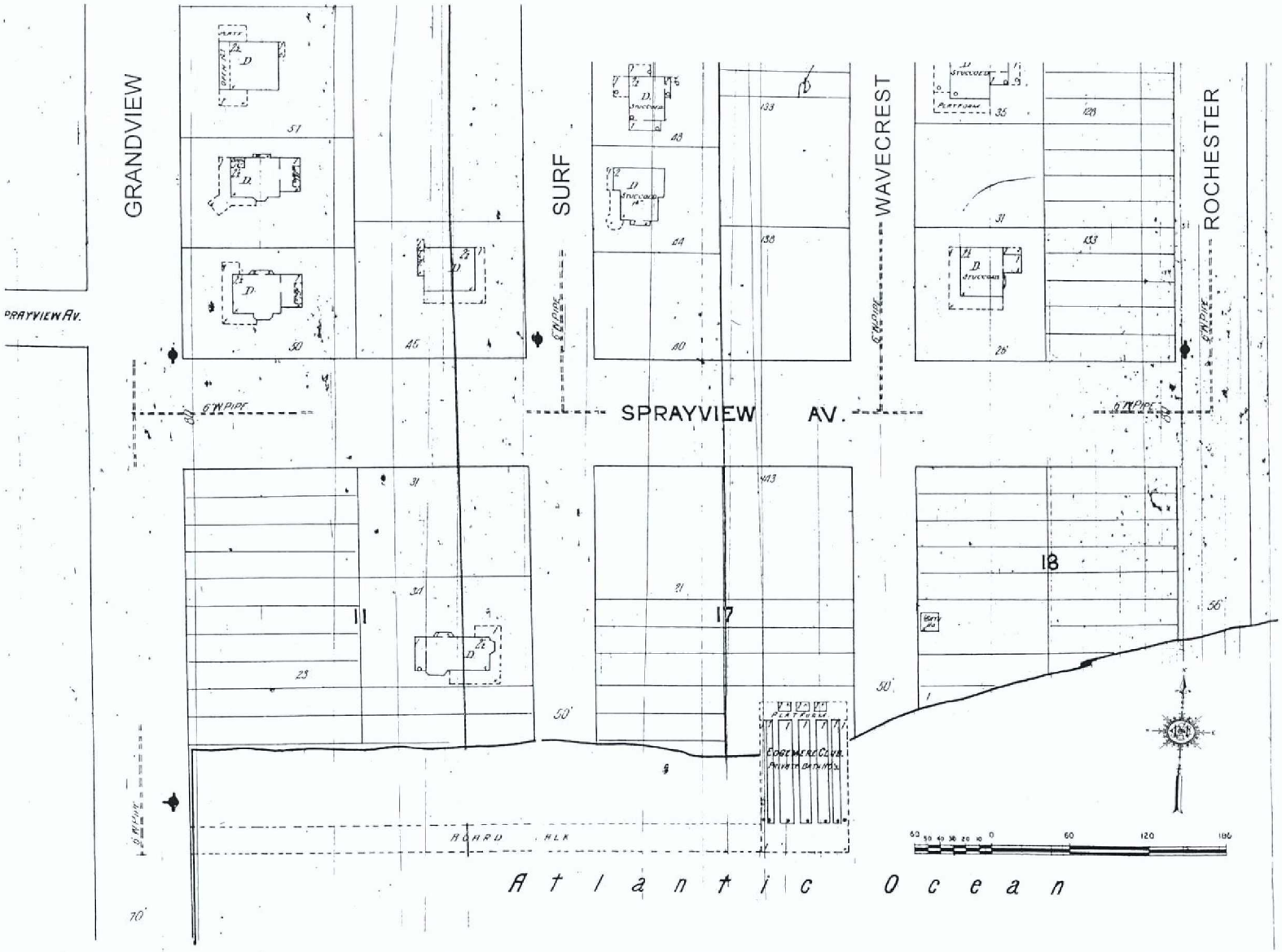


Figure 17b. Structures and streets in the project area in 1912. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1912:8:45*).

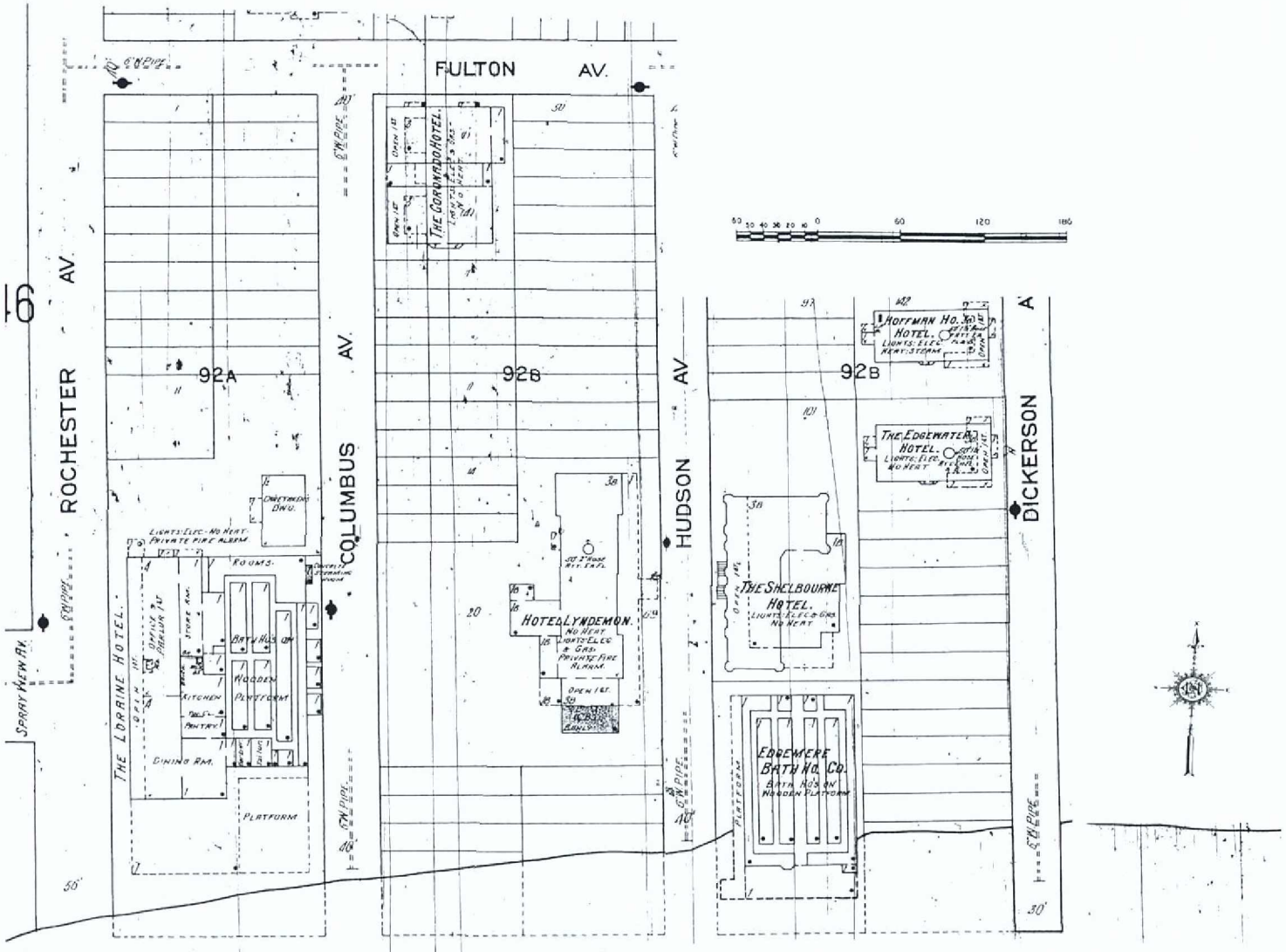


Figure 17c. Structures and streets in the project area in 1912. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1912:8:45*).

Figure 17d. Structures and streets in the project area in 1912. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1912*).

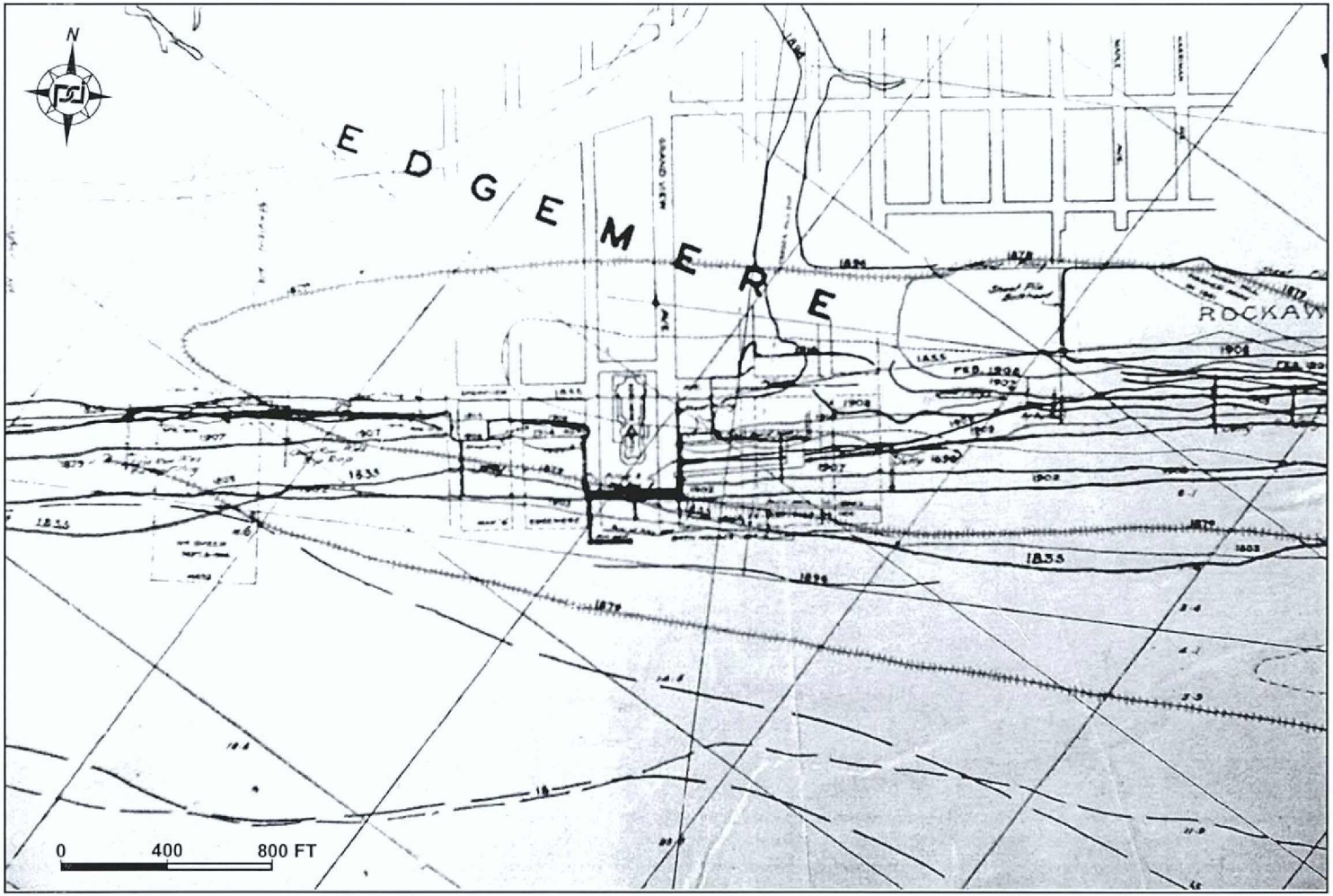


Figure 18. Nineteenth-century shoreline changes in the project area. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Borough of Queens Topographic Bureau 1917*).

The 1912 Sanborn map shows that dwelling houses had been constructed between Neptune and Ocean avenues (Beach 38th and 37th Streets; see Figure 17a) and at Surf Avenue (Beach 34th Street; see Figure 17b), and a pier extended outward from the shoreline at Neptune Avenue (Beach 38th Street). The Edgemere Club Bath House had been erected at Wavecrest Avenue (Beach 33rd Street), with a boardwalk connecting the bathhouse with the hotel at Grandview Avenue (Beach 35th Street; see Figures 17b and c). This was the only section of boardwalk that had been built at that time. The boardwalk that now extends along the shoreline was constructed between 1924 and 1933 and is located immediately south of the location of the Edgemere Hotel boardwalk as shown on the 1912 map. The Sanborn map also details a bulkhead that had been constructed along the shoreline frontage of the Edgemere Hotel. This bulkhead did not appear on either of the 1901 maps discussed above (see Figures 14 and 15).

Also by 1912, the Lorraine Hotel and adjacent bath house had been built between Rochester and Columbus avenues (Beach 32nd and 31st Streets) and the Hotel Lyndemon had been erected west of Hudson Avenue (Beach 30th Street). Further, the Shelbourne Hotel was located east of Hudson Avenue with the Edgewater Bathhouse immediately south of it, apparently extending over the water on pilings (see Figure 17c). These hotels were not equipped with heating facilities, as indicated on the map, which suggests that they were only occupied seasonally. These structures were located well to the north of the location of the existing boardwalk, which is approximately aligned with the southern end of the Edgemere Hotel as shown on the 1912 map (see Figures 17a and b).

It should be noted that neither bath house shown on the 1909 Bromley map (see Figure 16) is at the location of the Edgemere Hotel bath house in 1912 (see Figure 17b). The 1917 shoreline change map (Figure 18) delineated a boardwalk extending southeast of the Edgemere Hotel in 1896 and an associated bath house, shown between Surf and Wave Crest avenues (Beach 34th and Beach 33rd Streets). These features were not shown on any of the other maps examined for this study and this bath house was also rendered in a different location than either of the bath houses shown on the 1909 map. The reference for this area noted on the 1917 map appears to be an 1893 land map that may have detailed facilities for the Edgemere Hotel that were planned but not actually constructed when the hotel was completed in the following year.

The 1909 and 1912 maps show no development along the portion of the project area east of what is now Beach 29th Street. The 1912 map (see Figure 17d) reveals that the inlet known as the Bay of Far Rockaway still existed north of the outer beach shoreline east of Harriman Avenue (Beach 27th Street). The structures depicted on the 1912 map continue to be shown on the 1919 Ullitz map (Figures 19a and b), with an additional hotel constructed immediately west of present-day Beach 29th Street (Figure 19b).

The aerial photographs taken of the project area in 1924 (Figures 20a, b, c) picture changes that occurred during the early 1920s. Most of the summer hotels delineated on the 1919 map and most of the dwellings shown on the earlier maps still appear. However, these structures have been joined by a large number of what seem to be small bungalows along the shoreline, many of which

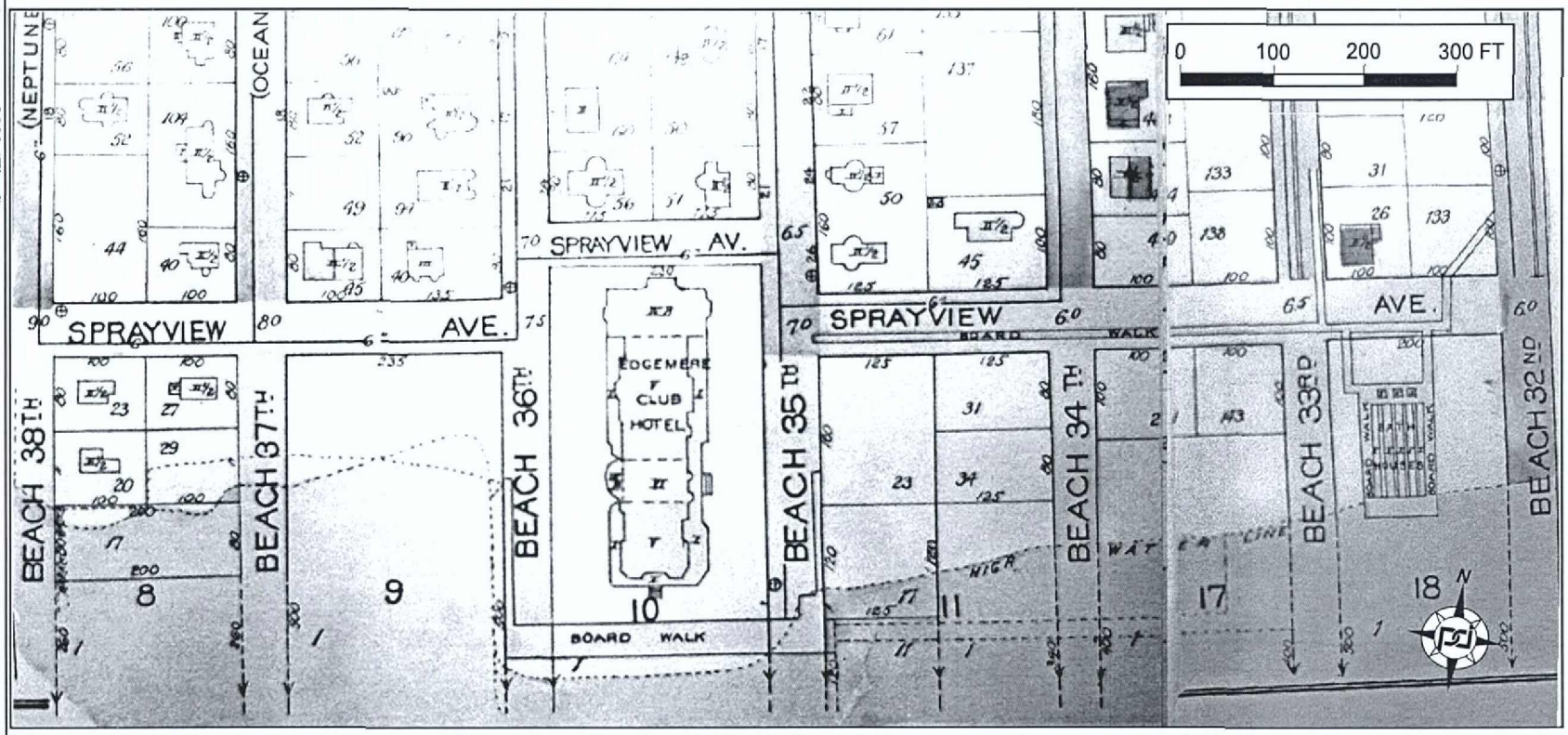


Figure 19a. Streets, structures and the shoreline in 1919. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Ullitz 1919:Plate 21).*

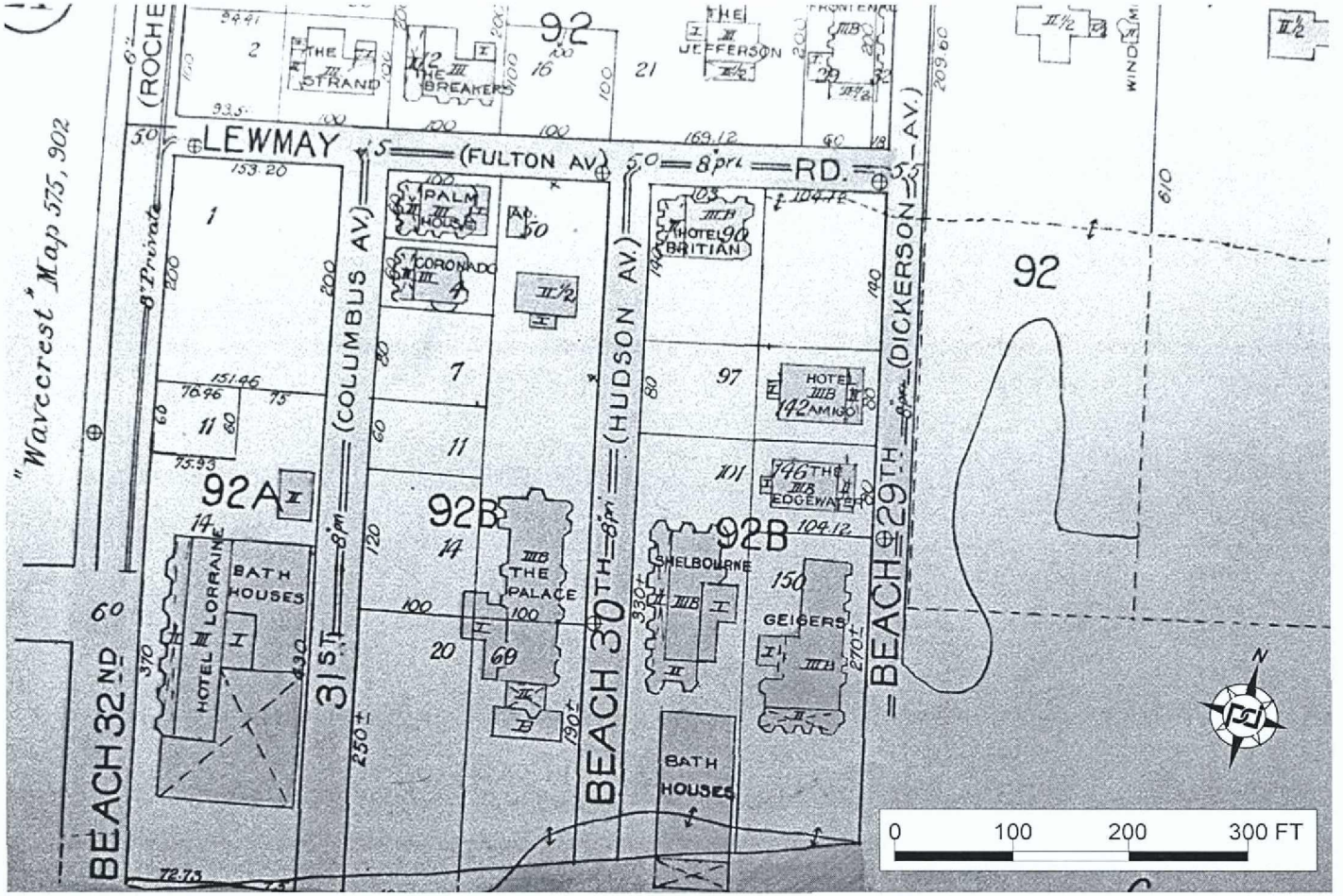


Figure 19b. Streets, structures and the shoreline in 1919. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Ullitz 1919:Plate 21).*

Figure 20a. Western portion of project area in 1924. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Fairchild Aerial Camera Company 1924: Section 31A).*

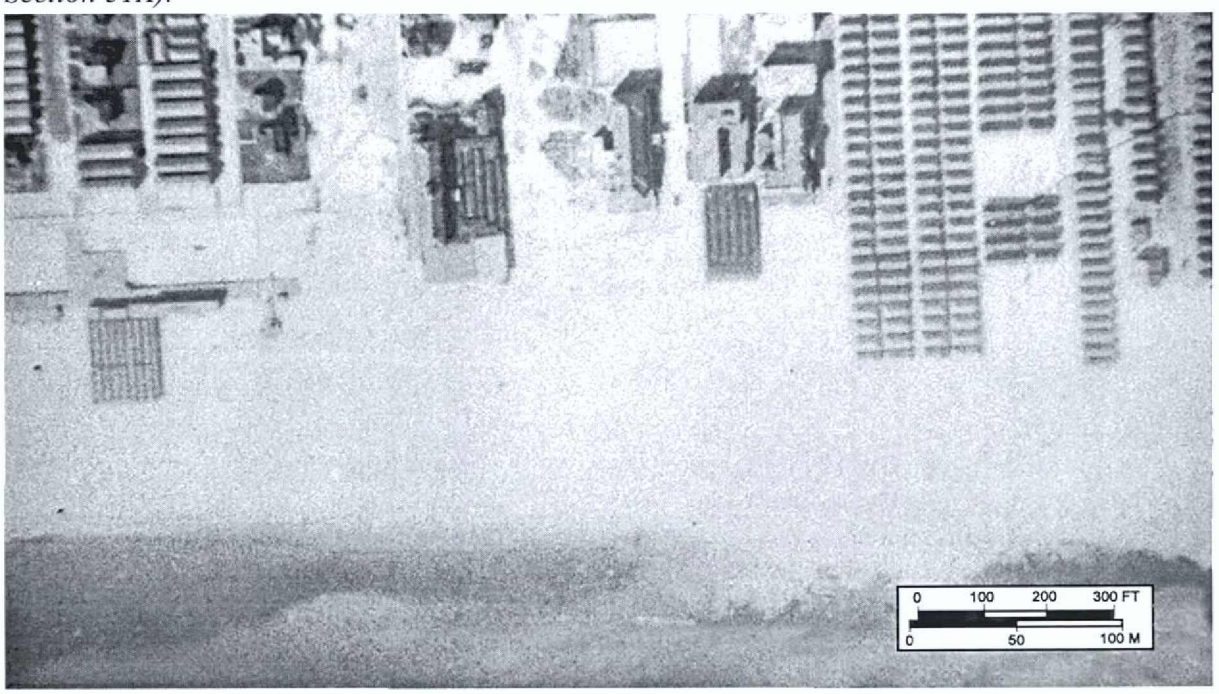


Figure 20b. Central portion of project area in 1924. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Fairchild Aerial Camera Company 1924: Section 31A).*

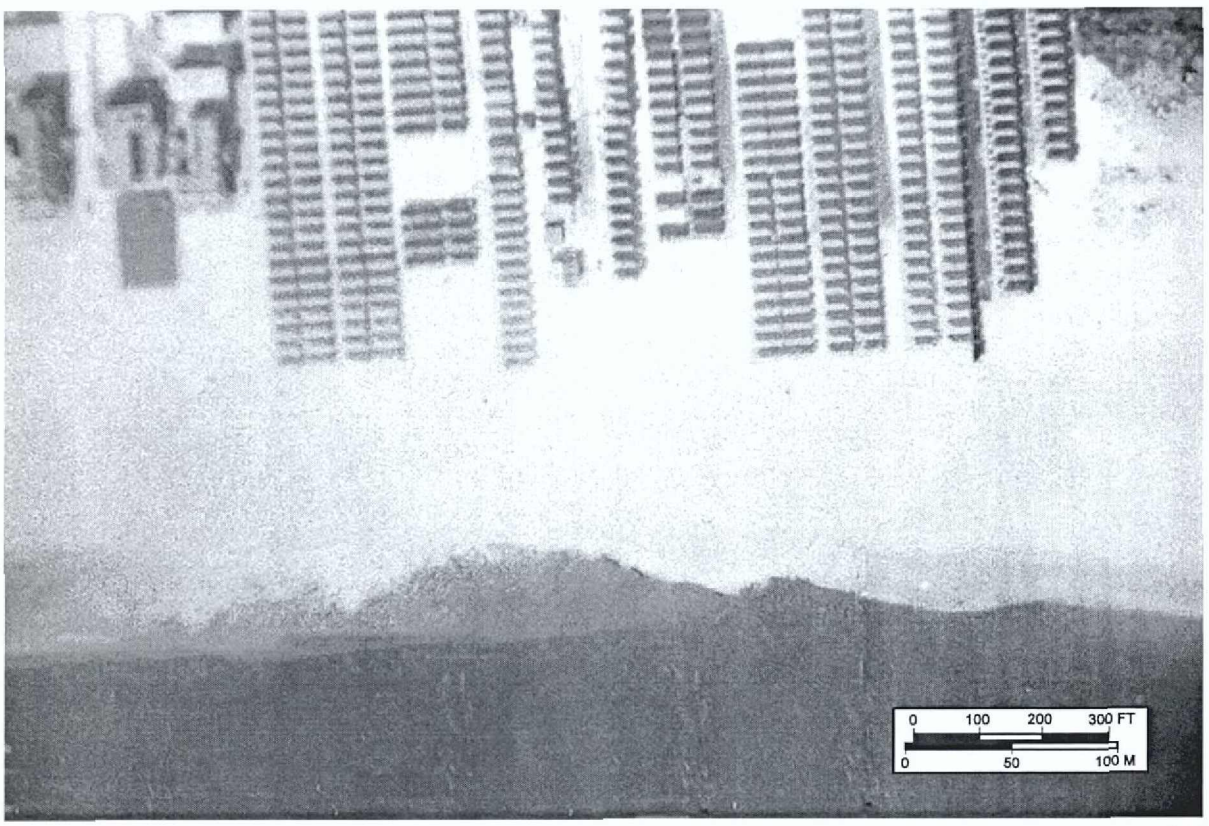


Figure 20c. Eastern portion of project area in 1924. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Fairchild Aerial Camera Company 1924: Section 31A).*

were in the previously unutilized portion of the beachfront east of Beach 29th Street. It would appear that with improved transportation facilitating beach access, the resort area had lost its "aristocratic" character noted in the turn-of-the-century publications. The new construction was apparently designed to appeal to a less economically affluent segment of the population. In Edgemere, "small cottages or bungalows [were] constructed in rows as quickly and cheaply as possible. Most were 15 x 30 feet [4.6 x 9 m] with a five-foot [1.5-m] side yard to the next door neighbor" (Gloeggler 1983b).

The beach within the project area as shown on the aerial photographs appears to have been extended outward since the 1917 shoreline map was prepared. Since this extension may have resulted from intentional sand placement or through natural accretion, the beach enrichment may have occurred earlier than the reported post-1926 date as noted above. The photographs also show what appears to be an "L-shaped" groin at Beach 36th Street that was probably installed to build the beach in front of the Edgemere Hotel (see Figure 20a). This groin is not shown on the 1919 Ullitz map (see Figure 19a), although it is indicated on the 1917 shoreline change map (see Figure 18). The bulkhead shown on the 1912 map along the hotel shorefront had become surrounded by beach sands by 1924 (see Figures 17a and 20a). The pier shown at Beach 38th Street on the 1912 map was not visible in the 1924 photographs. What may have been its buried remains can be seen on a line extending from the eastern side of Beach 38th

Street (see Figure 20a). The aerial photograph suggests that the pier may have been incorporated into an L-shaped groin which resulted in an accumulation of sand around the former pier.

Sanborn maps of 1933 (Figures 21a, b, c) show the present-day boardwalk already constructed. Moreover, examination of recent Sanborn maps reveals that the existing boardwalk continues to follow the approximate alignment as detailed in 1933. The 1933 map also demonstrates that the shorefront in the vicinity of the project area maintained the same character as that reflected in the 1924 aerial photographs; with the earlier hotels and bungalows still evident.

The location of the boardwalk can be approximated with respect to structures shown on earlier maps by a consideration of its relationship to the Edgemere Hotel, which existed throughout the period. The boardwalk followed or was located slightly seaward of the approximate line of the shoreline. None of the structures constructed in the area during the early-twentieth century were located seaward of the boardwalk The existing boardwalk is just south of the approximate line of the ca. 1912 boardwalk that connected the Edgemere Hotel to its bath house, located two blocks east at Wave Crest Avenue (Beach 33rd Street; compare Figure 17b with Figure 21a). The bulkhead built during the 1900s in front of the Edgemere Hotel would have been located about 35 feet (11 m) south of the present boardwalk. The groin constructed during the 1910s at Beach 36th Street, just west of the Edgemere Hotel, extended seaward from the present boardwalk for some 200 feet (60 m). The pier shown on the 1912 map at Beach 38th Street extended approximately 175 feet (53 m) south of the present boardwalk and the bath house shown on the 1909 Bromley map (see Figure 16) would have been located roughly 30 to 50 feet (9 to 15 m) south of it.

The Sanborn maps published in 1951 record only one major change in the area immediately landward of the boardwalk in the vicinity of the project area. Between 1933 and 1951, the Edgemere Hotel had been razed and a group of one-story cinderblock dwellings had been erected on a portion of the site, including a row of storefronts lining the boardwalk between Beach 35th and Beach 36th Streets. More recently, Sanborn maps from 1990 reveal that all of the buildings bordering the boardwalk east of Beach 35th Street had been demolished. Field reconnaissance conducted for this investigation noted that the structures west of this location have also been razed.

Hog Island. Several sources reference an island that was historically located offshore of Rockaway Beach. Gloeggler (1973) notes that "Hog Island stood off the shore of Far Rockaway as a sand bar. It rose from the Atlantic in 1866 and sank again in 1902." There were apparently resort facilities on the island, including a hotel that was washed out to sea in an 1896 storm (Gloeggler 1973). Despite its absence from all the maps examined for this study, "Hog Island" was apparently the name given to the outer beach that formed at the time of the incursion of the inlet (i.e., the Bay of Far Rockaway discussed below). It was not, therefore, actually an "island," but was connected to the mainland at its western end. As noted above, by 1901, the ocean had broken through the "outer beach" approximately 1,500 feet (458 m) east of the project area (Figures 22 and 23; see Figure 14). At that time the portion of the beach east of the new inlet became a part of Long Beach Island.

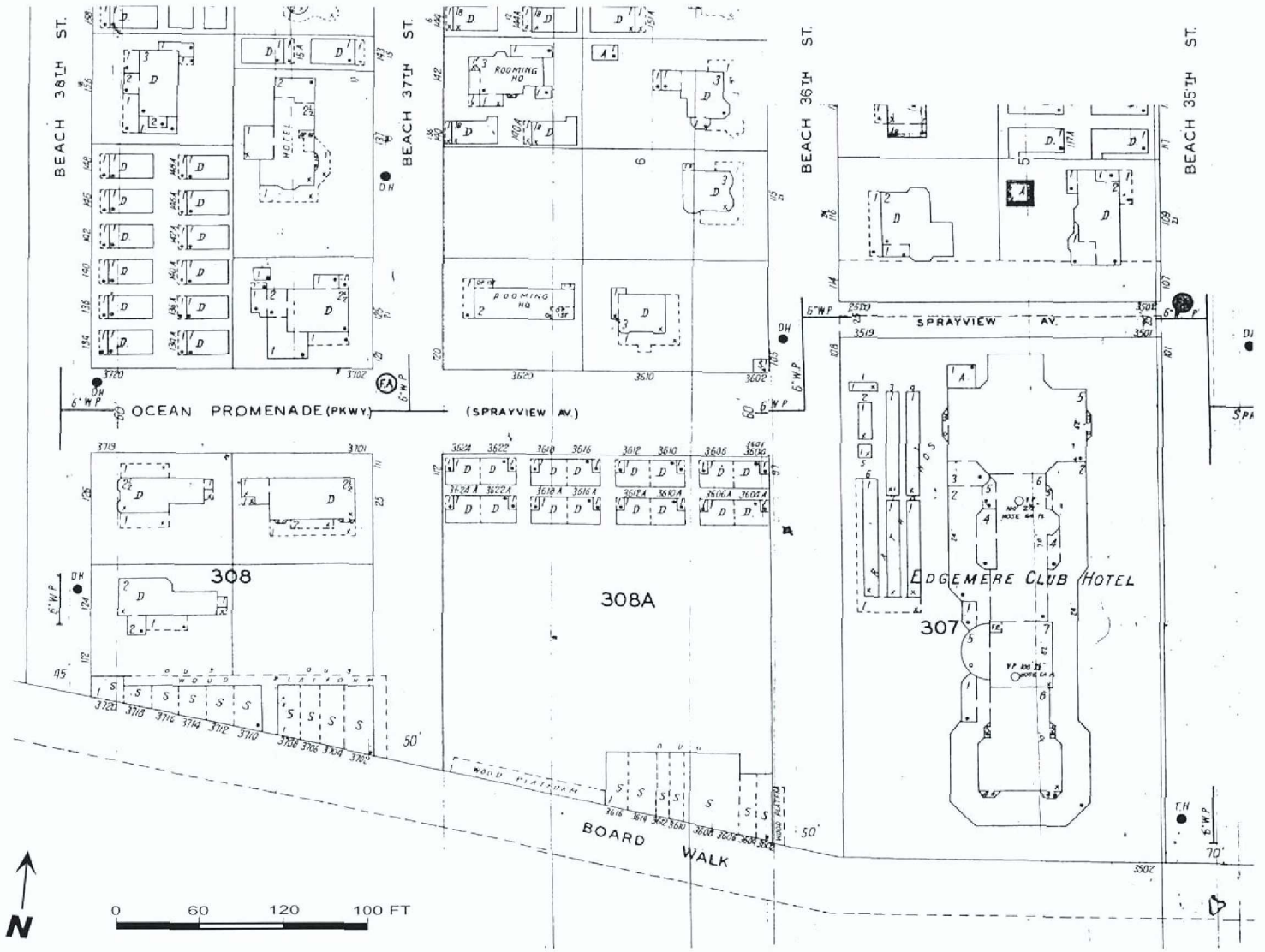


Figure 21a. Properties in the project area in 1933. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1933*).

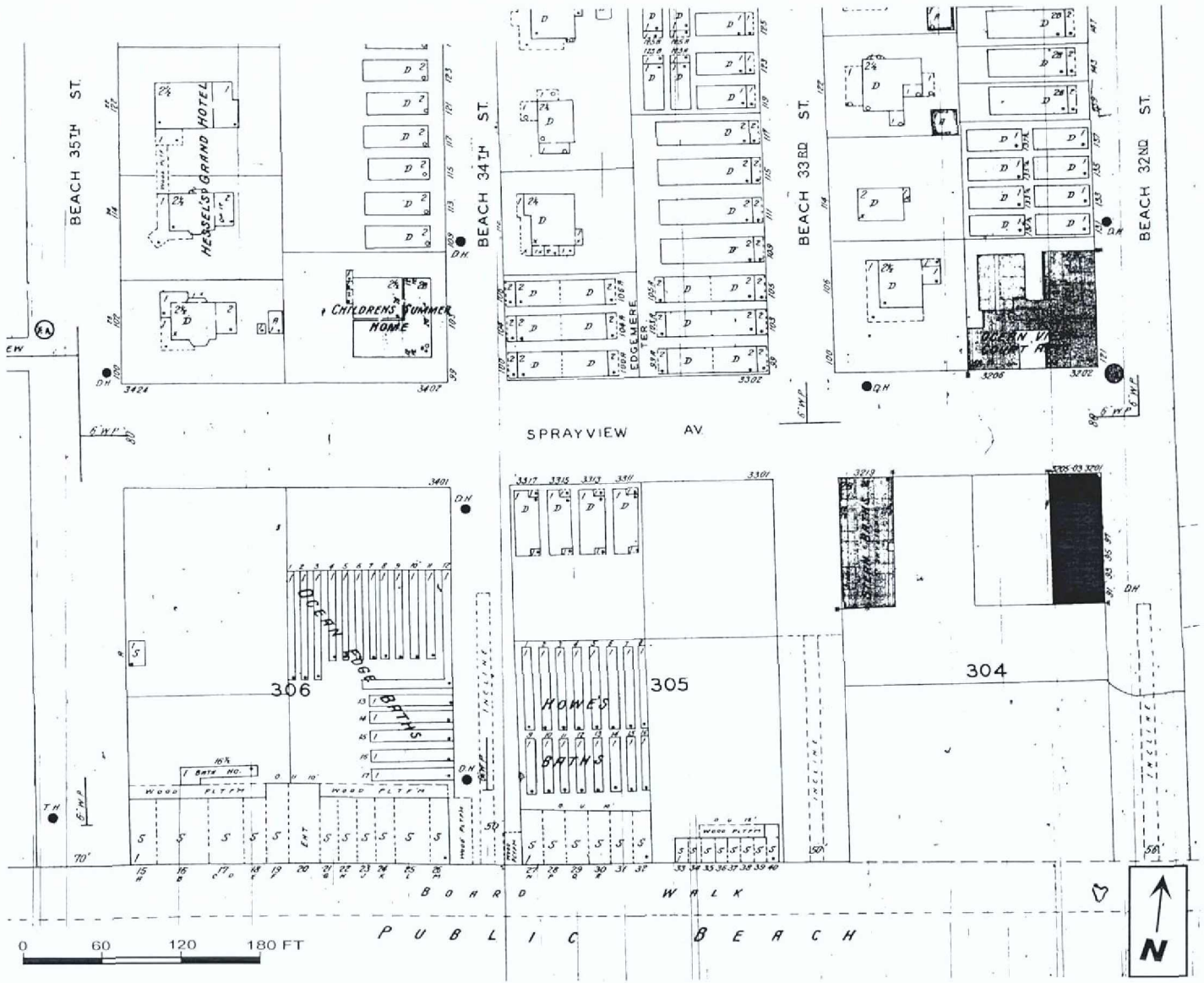


Figure 21b. Properties in the project area in 1933. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1933*).

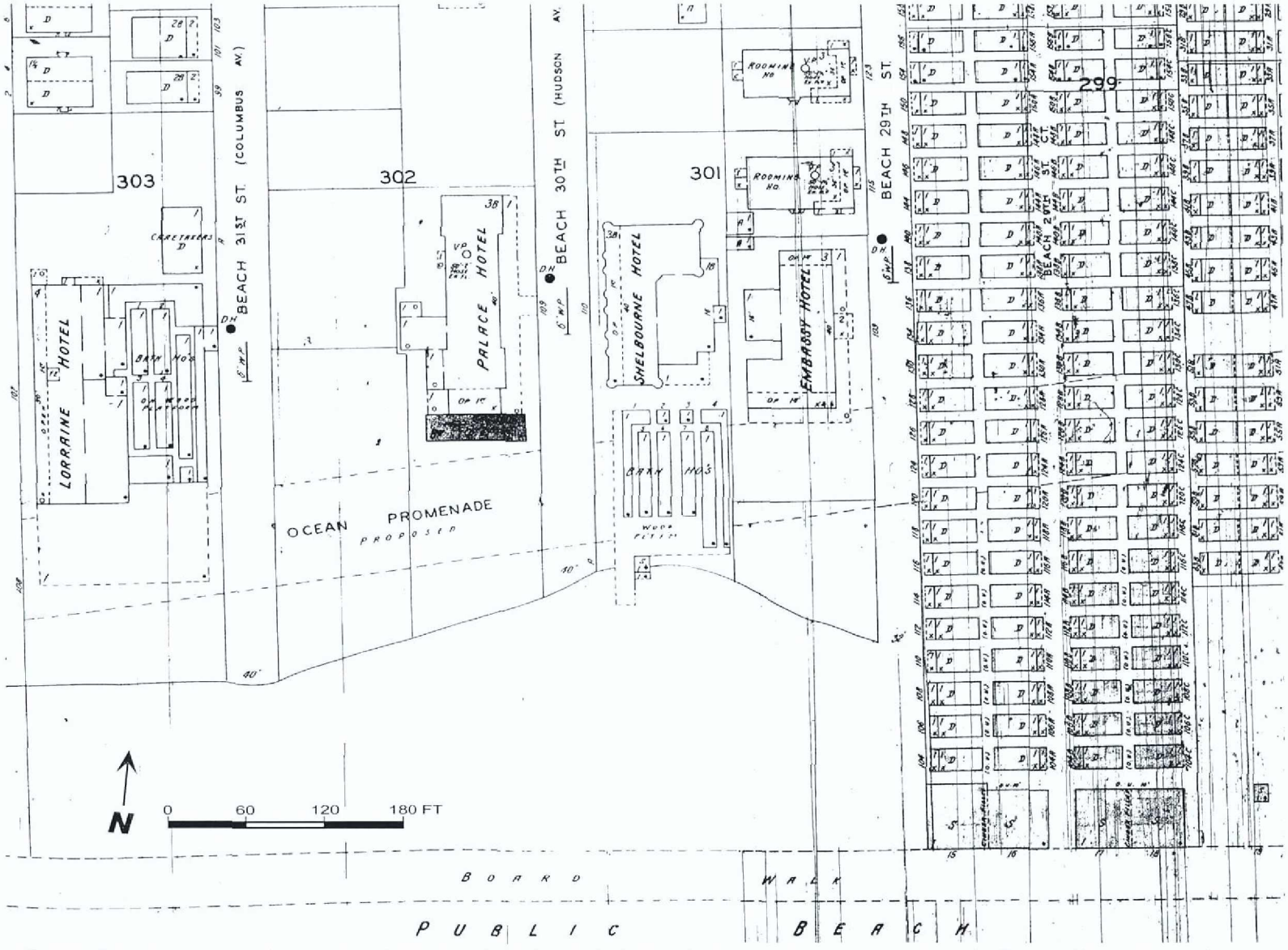


Figure 21c. Properties in the project area in 1933. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Sanborn Map Co. 1933*).

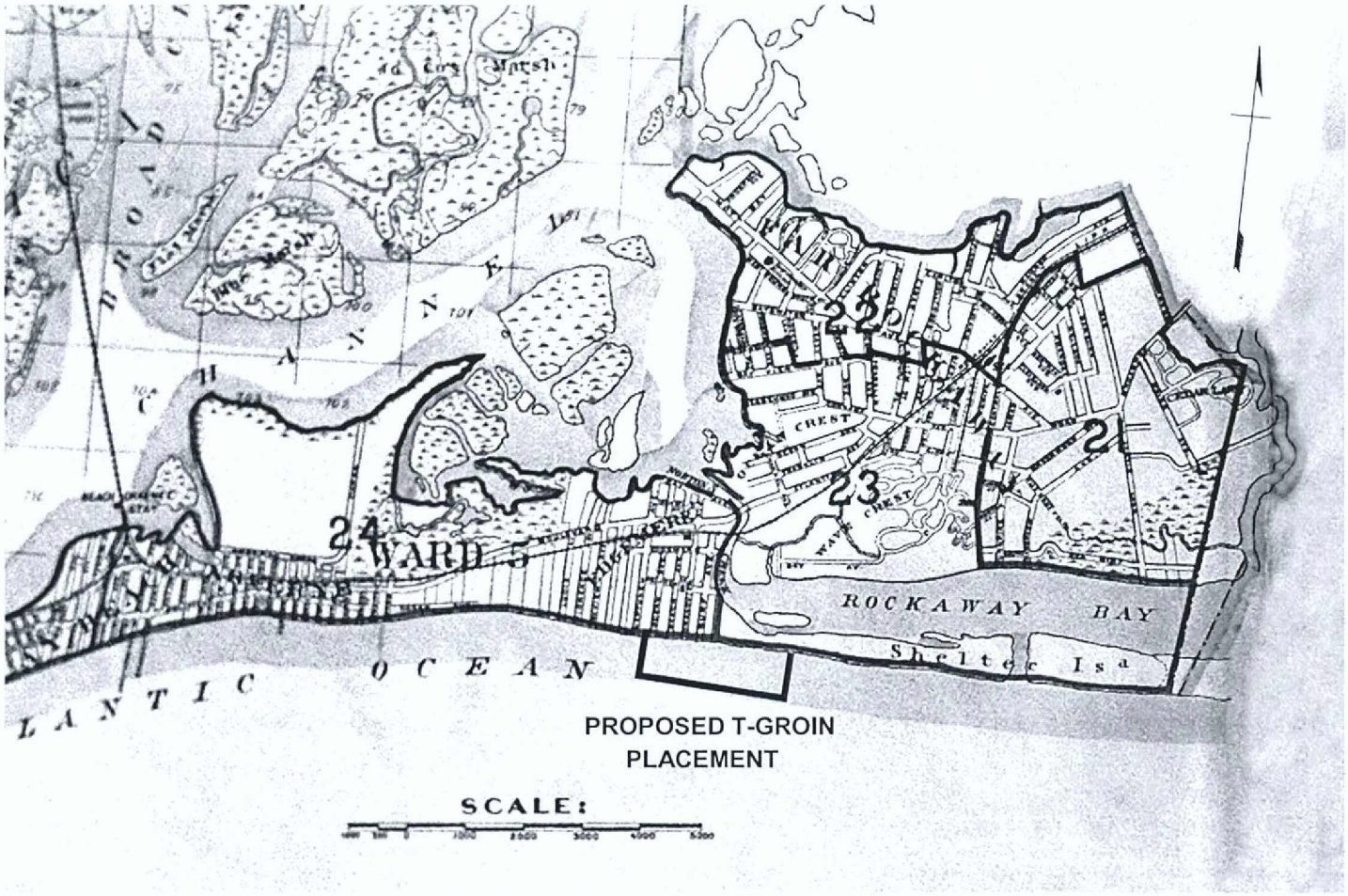


Figure 22. Rockaway Bay area in 1901. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Hyde 1901:1:Index Map).*

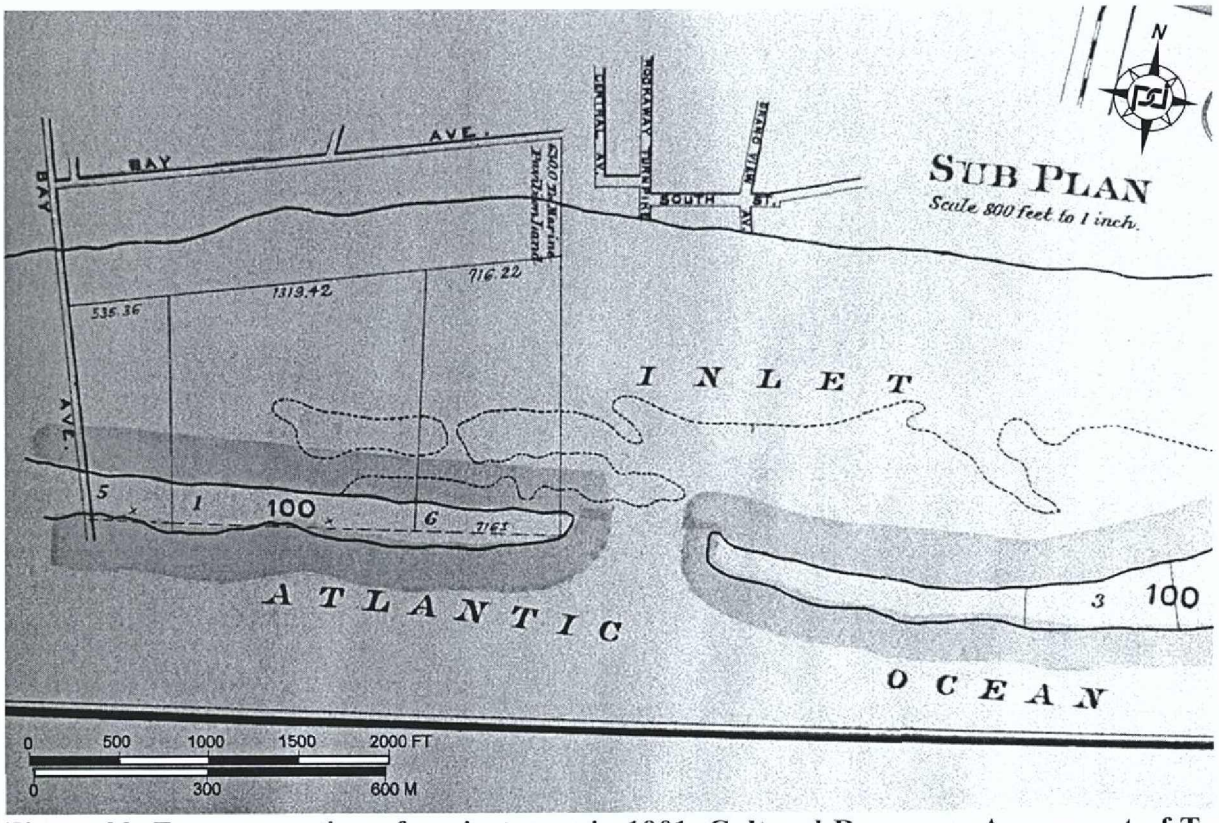
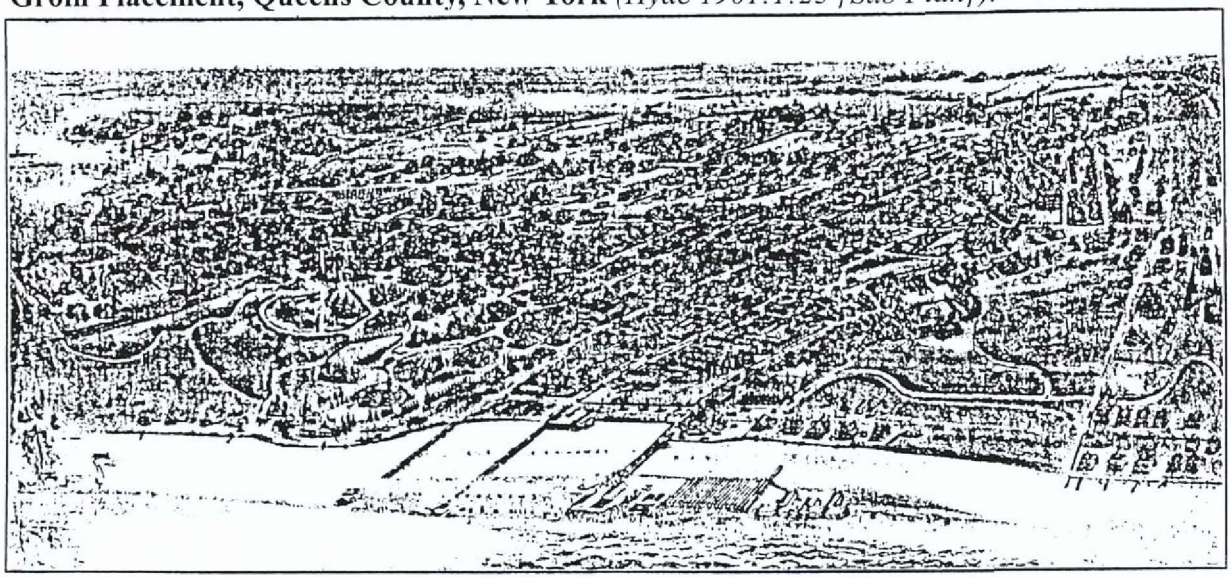


Figure 23. Eastern portion of project area in 1901. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Hyde 1901:1:23 [Sub Plan]).*



BIRD'S EYE VIEW OF FAR ROCKAWAY IN 1900.

Observe the outer beach (Hog Island), since washed away, with its bath houses, restaurants and ferries. Also observe the inlet at Edgemere connecting Jamaica Bay with the ocean. Bayswater and east of Edgemere section was not then built up as it is today.

Figure 24. Bird's eye view of Far Rockaway in 1900, portion of beach shown is east of project area. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Bellot 1918: 27).*

Bellot noted that during the turn of the nineteenth century,

> the bathing beach [at Far Rockaway] was separated from the village beach proper by Far Rockaway Bay and Inlet and it was on this outer beach , or Hog Island as it was called ... that a large number of bath houses ... were erected. The outer beach, about one thousand feet off shore was reached from the mainland by ferry boats. One of these was operated along a cable and another by sailboats, each being run by the bathing house proprietor, a fare of five cents per passenger being charged ... two or three restaurants furnishing refreshments and entertainment [were also opened on] Hog Island [Bellot 1918:94-95].

The Queens Borough Historical Collections (Works Progress Administration1938 I:183) also state that "Hog Island was the outer beach at Far Rockaway in 1900 formed by the ocean since 1870."

While the inlet (i.e., Rockaway Bay or the Bay of Far Rockaway) that separated Hog Island from the mainland was denoted on the 1879 map (see Figure 11) as some 1,000 feet (305 m) wide, as mentioned by Bellot, the 1912 Sanborn map (see Figure 17d) showed that by that time its western end had shrunk to only some 250 to 350 feet (76 to 107 m) across. The latter map also delineated two bath houses on the spit of land representing the outer beach west of the inlet at what is now Beach 19th Street which were connected with the mainland by boardwalks. The nearest boardwalk and bath house to the project area were located approximately 500 feet (153 m) east of Harriman Avenue (Beach 27th Street), east of the project area. These bath houses represented the westernmost extent of the "Hog Island" recreational facilities; neither of which were illustrated on the 1909 Bromley map (see Figure 16). Other recreational facilities were located east of the inlet as shown on the 1901 map (see Figure 23) and were shown on a 1900 bird's-eye view (Figure 24).

It appears that the eastern portion of the "Hog Island" sand spit was at the location of present-day Atlantic Beach. The western portion would have been at the present location of East Rockaway inlet. All of the outer beach west of the New York City line was shown as an area of shoal on a map showing the 1916 shoreline (Figure 25). The western portion of the shoal area is visible on the 1917 shoreline change map (see Figure 18).

Late-nineteenth century artifacts have been recovered on the beach at Edgemere which have been attributed to Hog Island establishments (Onishi 1997). Although possible, such artifacts would not be *in situ*, and, in fact, if they derive from Hog Island, then they would most likely have been deposited on the current beach as a result of having been incorporated into dredged sand fill placed on the beach during the twentieth century (as suggested in the article).

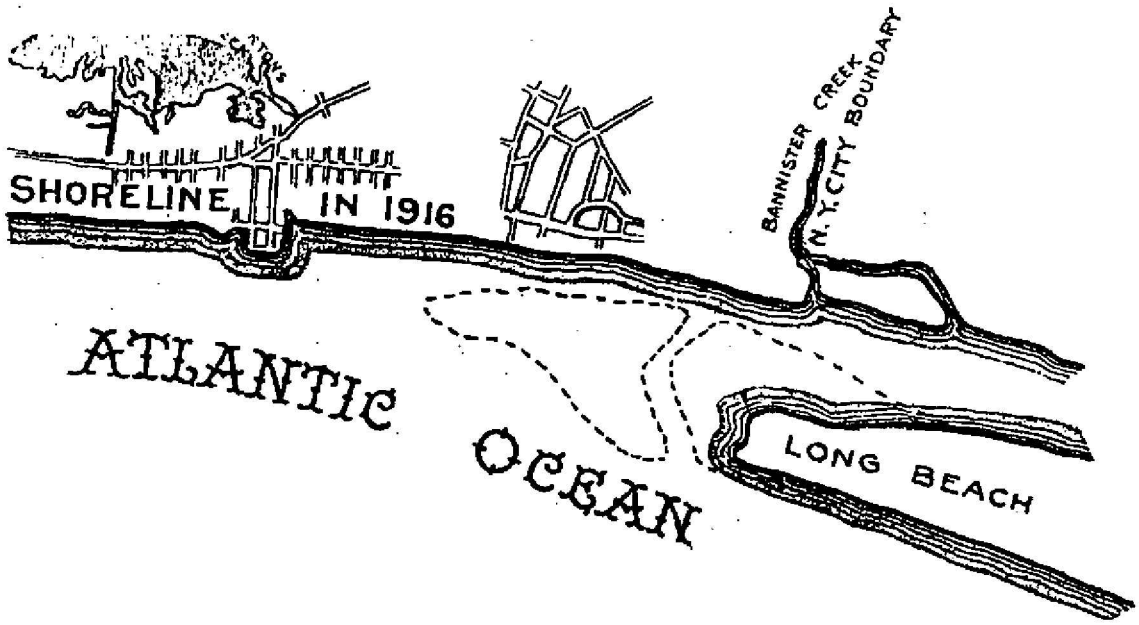


Figure 25. Drawing of 1916 shoreline. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*New York Public Library ca. 1918*).

Shipwrecks. Table 2 (next page) lists shipwrecks that have occurred in the Rockaway beach area as detailed in Kopper (1979). None of the located wrecks lie within the project area. That shipwrecks might be encountered in construction excavations in the Rockaway Beach area or uncovered by shifting sands is indicated by Kopper when he adds the following report of a wreck:

> According to an account in the Long Island *Daily Star* of February 25, 1920, a violent storm uncovered at Rockaway beach the hulk of an old "bluff-bowed" wooden ship. Captain Joseph Meade of the Rockaway Coast Guard Station advised the *Daily Star* reporter that the vessel was a sloop of war, having been equipped with nine guns, including an "old-time bow chaser." Other features included hand-wrought spikes, oak ribs, and a flush forecastle deck. The storm had washed away the sand until the hull stood four feet out of the water, showing the spar deck and in one area unearthing the top line of the gun deck. According to the newspaper article, "old salts" claimed the vessel was an old British sloop "and very likely to be of Revolutionary times." The vessel could not be identified, and the Coast Guard station, then in its forty-second year at Rockaway, had no record of a wreck fitting the description. . . . Rattray, in her 1973 book ... conjectures the ship could have been the *Liverpool* [Kopper 1979:13-14].

Less certain evidence of ships buried in the Rockaway sands was produced during the construction of the Rockaway Beach Hospital. According to a newspaper account dated May 1, 1958, the contractors while sinking piles hit some "strange substance." One of the architects connected with the project advanced the theory that the piles were hitting the hull of an old ship. The location along Rockaway Beach of the British ship noted above was not reported. The new Rockaway Beach Hospital was constructed in 1958 at Beach Channel Drive and Beach 51st Street (New York Times 1958), north of the beach zone and west of the project area. It is now the Peninsula Hospital.

Table 2. Rockaway shipwrecks *(Kopper 1979:18-19)*

Date	Vessel	Description	Report
Dec, 16, 1755	*Snow*	Jamaica Packet	wrecked at Rockaway
Feb. 11, 1777 (8)	*Liverpool*	24-gun British naval vessel[4]	wrecked off Rockaway Beach
Sep. 3-5, 1821	*Glorian*	schooner, 8 other vessels sank	sunk at Rockaway
Nov. 21, 1836	*Bristol*	American bark	wrecked at Far Rockaway
Mar. 7, 1860	*Virginia*	pilot boat	lost 10 miles east of Rockaway shoals
March.16, 1865	*Daniel C. Higgins*	schooner	ashore at Rockaway
Jan, 3, 1866	*Johanna Ward*	schooner	total loss, Far Rockaway
Nov. 17, 1866	*Flying Scud*	brig	stranded, Rockaway Beach
April 29, 1867	*Hound*	brig	ashore at Rockaway
Jan, 20, 1872	*Statesman*	schooner	wrecked, Rockaway
Apr. 9, 1872	*Breeze*	schooner	wrecked, Rockaway
Jan, 3, 1873	*Mic Mac*	brig	total loss, Rockaway Beach
March 12, 1875	*Amelia*	schooner	ashore on Hog Island, went to pieces[1]
Jan. 24, 1877	*James Lawrence*	schooner	(wrecked) one-quarter mile east of Rockaway Life Saving Station
Oct. 17, 1878	*Greenbury Willey*	schooner	Rockaway, total loss
Jan. 17, 1880	*Thor*	bark	stranded on shoals, Hog Island
Jan, 2, 1881	*Julia*	schooner	sunk, Hog Island Inlet Shoals[1]
Jan, 1, 1884	*Alexander Harding*	schooner	sunk, Hog Island Shoals,total loss[1]
Jul. 26, 1894	*Mabel Emma*	sloop	total wreck, East Rockaway Inlet[2]
1905	*Glide*	schooner	Rockaway, lost
July 13, 1917	*Edna*	sloop	lost 4 miles west of Long Beach[3]
July 22, 1919	*Charles E. Dunlap*	schooner	"What's left of her lies off the end of East Rockaway breakwater several miles south of Rockaway Beach"
1939	unidentified	unidentified	several miles south of Rockaway Beach

[1]Hog Island is probably the island, now gone, shown in dashed lines on the Rockaway shoreline map of 1916 (see Figure 25), and is so designated on other maps of this period. It almost certainly does not refer to the Hog Island in Hempstead Bay which is completely land-locked and far removed from open sea traffic.

[2]It is uncertain which "East Rockaway Inlet" is cited. The East Rockaway Inlet of the 1870s, and perhaps later, was located at the east end of what is now Atlantic Beach and was an entrance to Hempstead Bay.

[3]Long Beach is presently known as Atlantic Beach.

[4]According to Colledge (1969), the *Liverpool* is classified as a 6th Rate major war ship equipped with 34 nine-pounder cannons, measuring 118½ ft x 34 ft. Built by Gorill & Pownell, Liverpool, and launched Oct. 2, 1758, the ship was wrecked on Long Island, according to Colledge, Nov. 2, 1778. The vessel figured prominently in the Revolutionary War and was involved in many actions during the first two years of the war.

The area to be affected by the T-groin construction is within 300 to 400 ft (92 to 122 m) of the present shoreline. National Oceanic and Atmospheric Administration (NOAA) charts (Figure 26) show water depths as shallow, less than 6 ft (1.8 m) in much of the area and less than 10 ft (3 m) in the deeper western end. Thus, it is rather unlikely that heretofore unreported shipwrecks, or other types of prehistoric and historic resources, are present at or very near the current ocean floor.

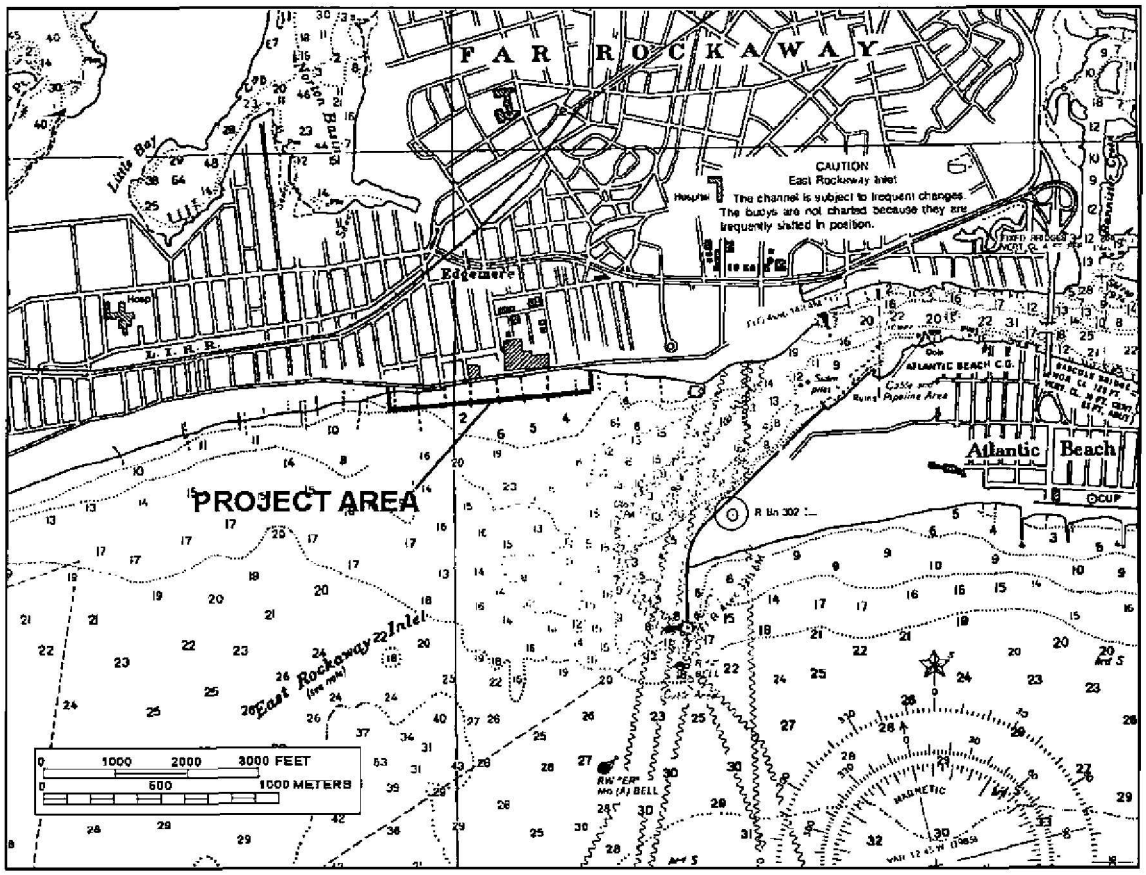


Figure 26. Portion of chart showing project area bathymetry. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(NOAA 1986).*

The probability of more deeply buried prehistoric and historic resources is discussed below in Sections 3.3 and 3.4. It should be noted, in reference to this probability assessment, that we estimate that the T-groin placement will involve excavating from 0 to 4 ft below the present sea floor for the base of the structure, as well as affecting an additional area to the sides and downward. Our calculation is based on the assumption that the -12.0 ft elevation measure in Figure 4 indicates the base of the T-groin will be twelve feet below the NGVD. With the current ocean surface being some 6-10 ft below the mean low tide water level (MLWL), and the MLWL being some 2 to 3 ft below the nearest NGVD to the project area, then the proposed excavation will impact the ocean floor to the range of depths just stated.

2.4 PREVIOUS STUDIES

A cultural resources investigation (Kopper 1979) was conducted in connection with a previous USACE project that involved the placement of sand on Rockaway Beach between Beach 19th and Beach 149th Streets. This study did not identify any significant cultural resources that would be impacted by sand placement, although it did not evaluate whether possibly deeply buried cultural resources could be impacted by groin construction. The only other cultural resources study that included the immediate vicinity of the project area was conducted in conjunction with a planned pipeline that was to traverse the beach between Beach 38th and Beach 39th Streets, at the extreme western edge of the proposed T-groin installation project area (Berger 1992). This study was concerned mainly with areas north of the Boardwalk and did not consider possible beach zone resources.

3.0 RESULTS OF THE INVESTIGATION

3.1 METHODS

Archival and documentary research and a walkover reconnaissance of the onshore portion of the project area were conducted as part of the cultural resources assessment. Background research included a review of files and documents from the New York State Historic Preservation Office; the New York Public Library, Map, Local History, and General Research divisions; Queens Borough Public Library, Long Island Division; New York City Municipal Reference Library; the New York State Museum; and the New York City Landmarks Preservation Commission. No field testing or coring was conducted in the project area as per the scope of work (USACE 1999). A visit to the project site was made on December 17, 1999.

3.2 BEACH ZONE MODIFICATIONS AND SHORELINE CHANGES

Natural Processes. The factors most strongly affecting the possibility of intact significant archaeological deposits remaining within the onshore portion of the project area are the natural processes operating within beach zones (Nordstrom et al. 1977, 1986). A beach is "one of the earth's most dynamic environments" (Nordstrom et al. 1986:12). "Almost all beaches are in a constant state of flux" (NJSPMP 1981 I:29). Yasso and Hartman (1975:10) note that "to the geologist, a beach is an accumulation of sediment along the shore kept in almost continual motion by wave, current and wind action."

Changes in the beach result from a natural system that works to maintain a balance among four factors: waves, water level, beach sand, and shape of the beach. In the short term, beaches undergo a cyclic change with the seasons. During the stormy weather which usually occurs during the winter, waves are generated by winds relatively close to shore. The resulting waves which impact the beach are steep—the wavelength (distance between waves) is only 10 to 20 times greater than the wave height. Such waves dissipate a large amount of energy as they break. Storm winds push the water toward the shoreline causing the waves to break higher on the beach, which results in a flattening of the beach profile as sand is moved off the beach (Figure 27). This sand is generally stored in offshore sand bars.

During the calm weather which generally prevails in the summer, waves that impact the beach are generated by distant storms and must travel far before reaching the beach zone, causing them to decay. Waves reaching the beach are long and low, having wavelengths 30 to 50 times their height. These waves move sand from the offshore bars back onto the beach, thus rebuilding the beach profile.

The effect of the above processes is to form one or more terraces or "berms" on the beach. Winds blowing inland transport fine sand from these berms to build up dunes, whose function is to provide natural protection from storm waves to the area behind the beach. Dunes also provide a "reservoir" which replenishes sand washed off the beach by storm waves and littoral drift. Within

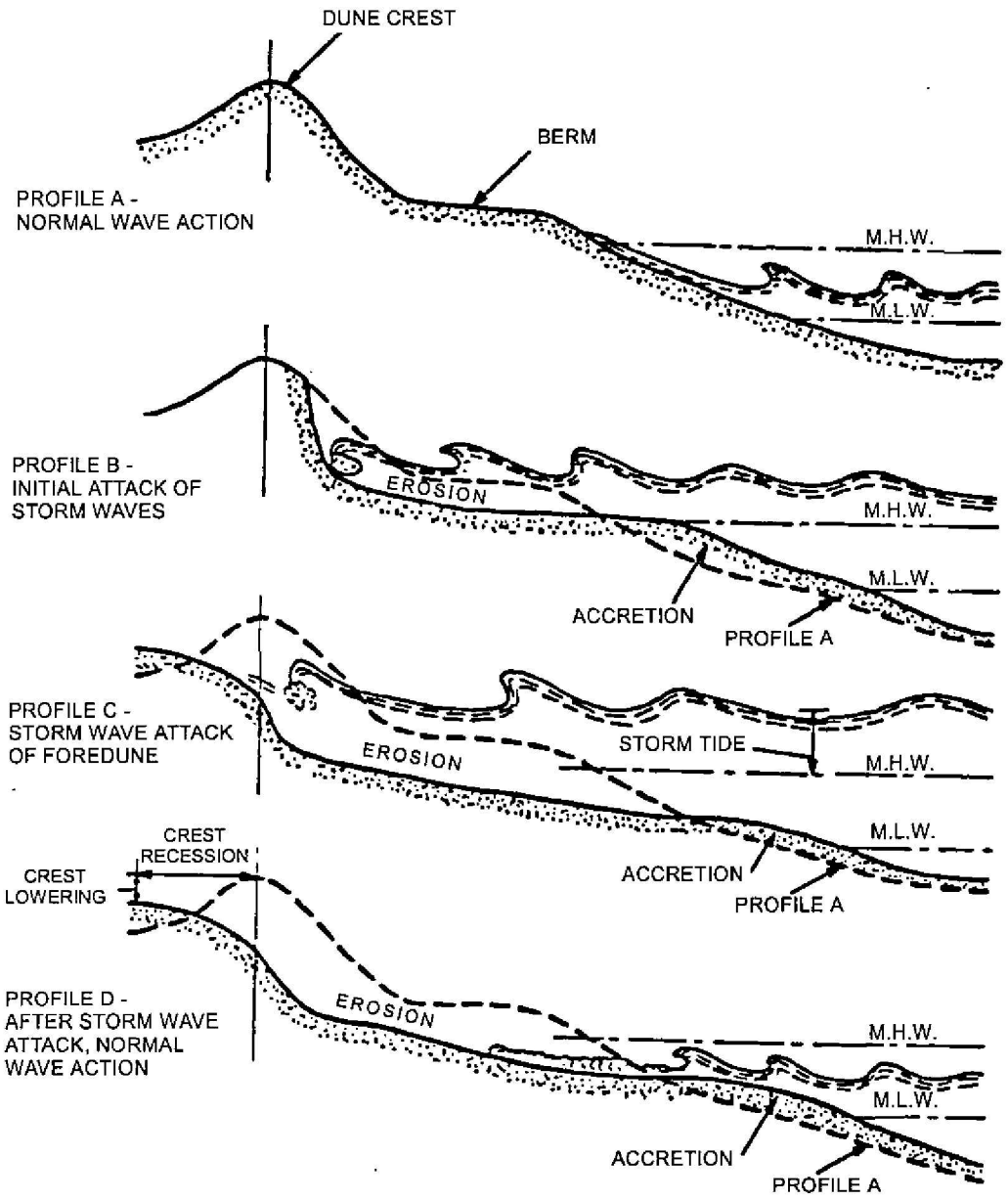


Figure 27. Diagram of beach changes due to storm-wave action. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*NJSPMP 1981:I:28*).

the project area, however, such protective dunes have been removed as the result of twentieth century development, although an effort to reestablish dunes was noted at the eastern end of the project area (east of Beach 28th Street) during the site reconnaissance.

Part of the dynamic beach process is littoral drift. Since waves impinge on the shore at an angle, they move sand along the beach as well as onto and off the beach. Although the direction of drift can vary from time to time, the net balance over a yearly period—the annual littoral drift—is to the west within the project area (Williams 1976).

Long term shoreline changes are caused by major storms. Two types of storms have resulted in severe impacts to the project area. Hurricanes are tropical or subtropical storms producing high winds, waves, rainfall and tidal flooding. Nor'easters are extratropical storms with wind velocities less severe than those of hurricanes, although these storms may result in more prolonged periods of onshore winds than hurricanes, which result "in longer periods of flooding and wave attack" (USACE 1973:20-21). Between 1635 and 1962, 35 major storms and 98 other less severe storms were recorded in the project area (USACE 1965:26).

During the twentieth century, storms having a significant impact on the project area occurred in September 1938, September 1944, November 1950, November 1953, August 1954, September 1960, March 1962, March 1984, and September 1985 (USACE 1989). More recently, significant beach erosion has resulted from storms in 1992 and 1993 (Onishi 1997).

Previous Beach Enrichment and Shore Protection Efforts. It is important to note that in addition to the constant reworking of the beach sands by the processes noted above, much of the present project area beach surface is a result of "beach enrichment." Between 1926 and 1930, 5,200,000 cubic yards of sand were placed along the beach between Edgemere and Jacob Riis Park. In 1958 a total of 1,250,000 cubic yards were deposited on the beach at Far Rockaway and Edgemere (USACE 1965:32). The latter beach enrichment project resulted in a 2-to-6-ft (60- to 180-cm) increase in beach grade between Beach 9th and Beach 52nd Streets (Feron 1958). Additional sand dredged from offshore borrow areas was placed on the beach after 1974. Most recently, dredged sand was placed on the beach at Edgemere to repair erosion caused by the storms of 1992 and 1993 (Onishi 1997).

Groins have also been built along the Rockaway shoreline as part of the shore protection efforts. Between 1926 and 1930, timber groins were built along most of the Rockaway shore front, including the Edgemere portion, at 200-to-350-ft (60-to-107-m) intervals. These groins were 200 to 400 ft (60 to 120 m) in length with the seaward ends at 1 to 4 ft (30 to 120 cm) above mean low water. Prior to this period, only isolated groins had been constructed along Rockaway Beach. Five large stone groins, 500 to 600 feet (150 to 180 m) in length were constructed on the beach at Edgemere by the State of New York between 1956 and 1962 (USACE 1965:32). The remains of some of these timber and stone groins were noted during the site reconnaissance.

Shoreline Changes. The processes discussed above have resulted in constant modification of Rockaway Beach. Examination of eighteenth century and nineteenth century maps indicate the changing configuration of the shoreline. The 1781 Taylor and Skinner map (see Figure 7) showed Rockaway as a long, narrow spit of land attached to and extending westward from Long Beach. At that time the western end of Rockaway Beach was roughly two miles east of its present location. East Rockaway Inlet did not yet exist. The beach extended unbroken eastward to an inlet approximately three miles east of Far Rockaway. The 1779 Sauthier map (see Figure 8) illustrated only a slightly different configuration than the 1781 map; the eastern end of Rockaway Beach overlapped and was separated by a small inlet from the western end of Long Beach. Rockaway and Long Beach continued to be connected until the end of the nineteenth century.

In 1917, the Queens Borough topographic bureau produced a map detailing changes in the Rockaway Beach shoreline between 1803 and 1916 (see Figure 18). The location of the present project area beach zone in relationship to the shorelines shown on the 1917 map can be determined by noting the position of the present-day boardwalk in relation to the Edgemere Hotel, which is rendered on the 1917 map and was still standing when the boardwalk was constructed (see Section 2.3 for a discussion of twentieth century development of this area). As noted, the present boardwalk is situated just south of the location of the hotel as depicted on the 1917 map. East of the hotel at Grandview Avenue (present-day Beach 35th Street) the line of the existing boardwalk would be just south of the line of the hotel boardwalk as shown on the 1917 map. West of the hotel as shown on the shoreline change map (i.e., west of the present Beach 36th Street), the boardwalk angles slightly to the north, so that it would intersect Beach 38th Street at about the location of the 1914 shoreline as shown on the 1917 map.

As can be seen on the 1917 shoreline change map, the shoreline in the early nineteenth century was approximately 100 to 250 ft (31 to 76 m) seaward of the present boardwalk location. Major changes to the shoreline also occurred prior to 1879. By that date, an inlet had developed which separated the southern or "outer" portion of Rockaway Beach from the main portion of the peninsula. The inlet is not shown on the 1859 Walling map (see Figure 10), and a notation on the 1917 shoreline change map of a "high hill washed away in 1861" suggests that the inlet formed at that time. This inlet, which actually represents a westward extension of the present Hempstead Bay, is labeled "Rockaway Bay" or "Far Rockaway Bay" on various late-nineteenth century maps.

Comparison of the 1917 shoreline change map with the 1879 coast survey map (see Figure 11) reveals that the inlet as shown on the former map included both open water and marsh at its western end, which extended to the approximate location of the present Beach 42nd Street. The southern shoreline of the inlet was located at or immediately south of the present location of the boardwalk and the open water and marshland of the inlet extended northward up to 1,000 ft (305 m) from that point. The ocean shoreline of the outer portion of Rockaway Beach, south of the inlet, was roughly 400 ft (122 m) south of the boardwalk in the western portion of the project area and some 600 ft (183 m) south of the boardwalk in the eastern portion. As shown on the 1886 Beers map (see Figure 12), Rockaway Beach continued to be directly connected to the western end of Long Beach. The inlet that separated the eastern and western portions of the Rockaway/Long

Beach barrier beach continued to be at approximately the same location as shown on the eighteenth century maps, approximately three miles east of the present location of East Rockaway inlet. By the end of the nineteenth century the beach's ocean shoreline had retreated northward from its 1879 position and was about 200 ft (60 m) north of the present boardwalk location in the eastern portion of the project area. The shoreline change map shows that by 1896 the western end of the Bay of Far Rockaway had migrated eastward to the vicinity of Beach 33rd Street. The area of marsh and water between this point and the bay's former western end at Beach 42nd Street had been filled.

The 1897 and 1901 Hyde maps (see Figures 13 and 22) illustrate that at that time Norton Creek connected Jamaica Bay with the western end of the inlet (i.e., the Bay of Far Rockaway) east of Surf Avenue (Beach 35th Street). The outer beach continued to extend to the east on the southern side of the inlet (labeled "Rockaway Bay" on the 1901 map). These maps showed that a small inlet, connecting Rockaway Bay with the Atlantic Ocean, had broken through the outer beach at the approximate location of Rockaway Turnpike, and intersected the shoreline in the vicinity of what is now Beach 19th Street, near the mouth of East Rockaway Inlet.

The shoreline change map shows that Rockaway Bay existed north of the eastern end of Rockaway Beach at least through 1908, at which time its western end was at the approximate location of Beach 29th Street. West of this point the former location of this inlet was once again dry land. Young (1953) stated that this area had been filled in, which is consistent with the presence of a sheet pile bulkhead at the western end of the inlet as shown on the 1917 map. As discussed in Section 2.3, the Rockaway outer beach that existed at the turn of the century was known as "Hog Island," although it is labeled "Shelter Island" on the 1901 map.

Existing Structural Remains. During the site visit the remains of five timber groins were noted within the project area, one of which was largely covered with beach sand (Figures 28, 29, and 30). Two additional timber groins at the eastern end of the project area were completely buried, except for pilings that apparently represent their seaward end (Figure 31). A stone groin was noted in the project area in the vicinity of Beach 36th Street (Figure 32), and another in the vicinity of Beach 39th Street, at or near its western boundary. Several additional stone groins were visible further to the west. The remains of a stone groin were noted east of the project area at the approximate location of Beach 22nd Street (Figure 33).

Along the entire length of the project area, the land adjacent to the north (landward) side of the boardwalk is vacant (Figure 34). Buildings that formerly stood in this area were removed during the latter part of the twentieth century, apparently as part of various "urban renewal" projects.

3.3 Potential for Submerged Prehistoric Sites

Submerged Beach/Immediate Offshore. The presence of prehistoric artifacts from Fire Island (see Section 2.3), as well as a report of material found on the Rockaway Beach shoreline (Nancy Brighton, personal communication 1999), attests to the utilization of the barrier island chain along the south shore of Long Island during the later prehistoric period. Utilization most likely took the

Figure 28. Remains of wooden groins, facing east from vicinity of Beach 35th Street. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Pickman 1999).*

Figure 29. Remains of wooden groin, facing southwest between Beach 32nd and Beach 33rd Streets. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Pickman 1999).*

Figure 30. Partially buried remains of wooden groin, facing south between Beach 29th and Beach 30th streets. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Pickman 1999).*

Figure 31. Pilings at the end of the buried wooden groins, facing west from vicinity of Beach 26th Street. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Pickman 1999).*

Figure 32. Rubble mound groin in the vicinity of Beach 36th Street, facing southwest. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Pickman 1999).*

Figure 33. Remains of stone groin at approximate line of Beach 22nd Street, facing southeast. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Pickman 1999).*

Figure 34. Boardwalk between Beach 25th and Beach 26th Streets, facing west. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Pickman 1999).*

form of short-term fishing and shellfish gathering trips. The finds to date either lack a clearly-specified context or were obtained from disturbed areas. The origin of material from an active beach zone needs to be examined carefully. An actual site is possible, but frequently the source of artifacts results from various redeposition factors such as being washed ashore as a result of littoral drift or being derived from sand deposits dredged from other locations. Consideration of the physical processes that continually reshape Rockaway Beach and the past human pattern of exploitation, forecasts that intact prehistoric archaeological sites are not likely to be located on or near the surface of the present beach or immediate offshore area. The probability of more deeply buried early prehistoric sites still needs to be considered.

Submerged Prehistoric Sites. During the final (Wisconsin) glaciation sea water was tied up in glacial ice and the sea level was as much as 400 ft (120 m) lower than at present. The shoreline lay at the outer edge of the continental shelf, about 100 miles from the existing shoreline. A major estuarine embayment was present at the location of the submerged Hudson River Canyon (Belknap and Kraft 1977; Kraft et al. 1983) which was located 10 miles southwest of the project area. Models of the last deglaciation for southeastern New York State derived from floral remains and Pleistocene fauna suggest that the glacial ice had disappeared earlier than 15,000 years ago. Tundra-like conditions probably existed near the terminal moraine in western Long Island as the land responded to changing drainage patterns in the wake of the receding glacier and rising sea levels (WES 1995:30; Funk 1993:43-44; Marshall 1982:17; Williams and Duane 1974:17). As a result, large portions of the continental shelf remained viable for human occupation and utilization during most of the Holocene.

The retrieval of fossil remains of Pleistocene and early Holocene megafauna—including mammoth, mastodon and ground sloth—from the continental shelf off the coast of New Jersey and Long Island shows that the area was indeed exposed during early prehistoric times (Figure 35). Most of these remains were recovered by scallop and surf-clam fishermen, frequently from locations where water depths are about 260 ft (80 m) (Edwards and Emery 1977; Edwards and Merrill 1977).

It is significant that no sites from the early prehistoric Paleo-Indian and Early Archaic periods have been reported from Long Island, although isolated finds of artifacts attributable to these periods have been identified (e.g., Saxon 1973). It has been suggested that sites from these periods were located closer to the former shore lines and are now submerged (e.g., Emery and Edwards 1966).

That such sites are indeed submerged and remain to be discovered is also supported by the locations of prehistoric sites on the continental shelf of North America that are presently in shallow water conditions. For Long Island, four coastal sites are known: Shoreham, Stony Brook Harbor, Mt. Sinai Harbor and Cedar Creek. Shoreham and Stony Brook Harbor date to the Late Archaic, and are located on land adjacent to a salt marsh and extending, in the case of Shoreham, to 6 ft (2 m) below the marsh surface. The last two sites date to the Woodland period and are comprised primarily of faunal refuse mounds, with the Mt Sinai Harbor site 2 ft (.6 m) below present mean sea level and Cedar Creek 8 ft (2.5 m) below the same reference datum (Stright 1990:439-443).

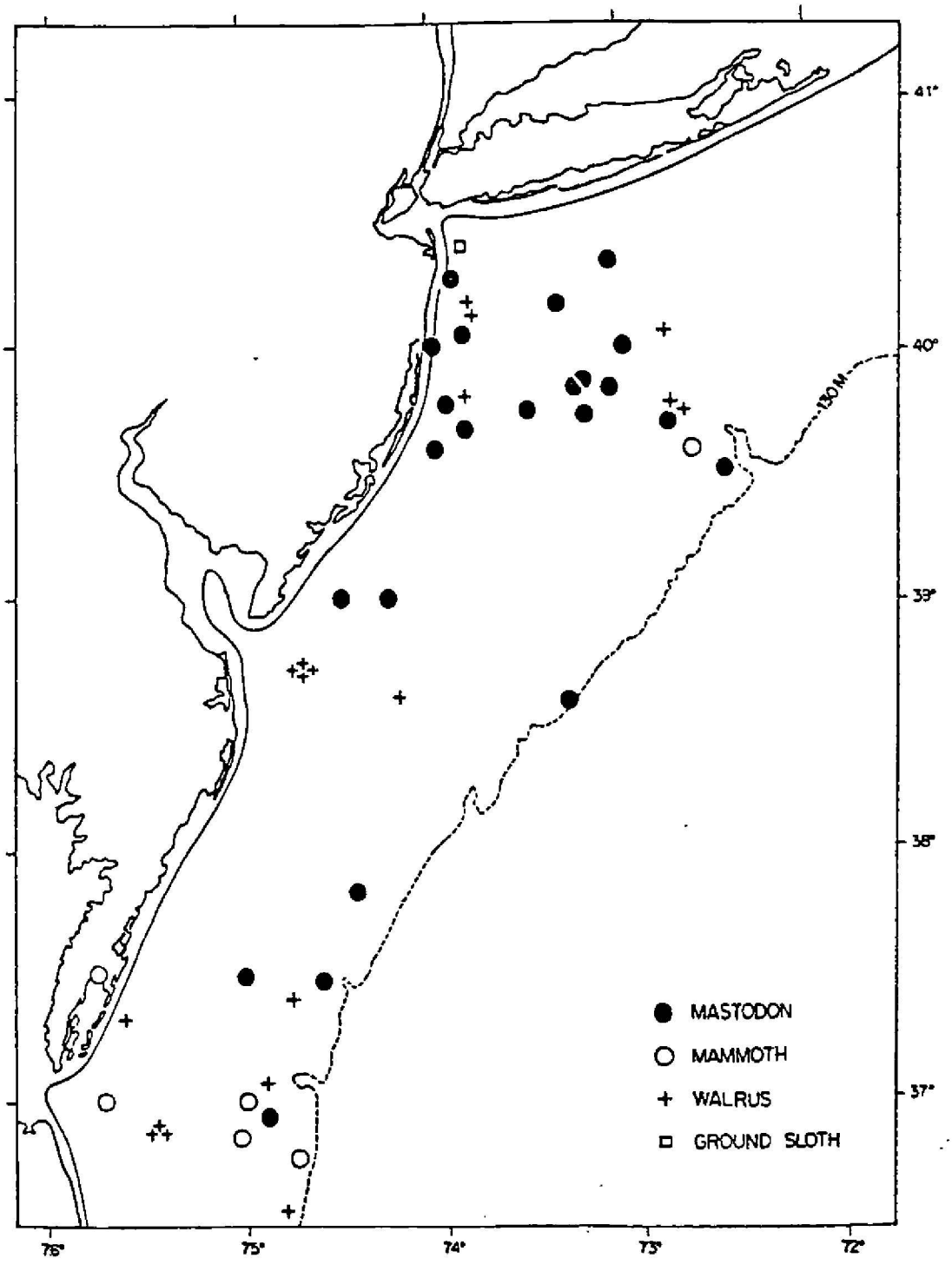


Figure 35. Locations of continental shelf fossil recoveries. Cultural Resources Assessment of T-Groin Placement, Queens County, New York (*Edwards and Merrill 1977:11*).

The potential for locating deeper, submerged, well-preserved prehistoric sites on the continental shelf is difficult to assess. Even though no sites have been found, recovered materials suggest their presence. Non-contextual artifacts have been reported by clam dredgers off the New Jersey coast. These items include a granite mortar obtained at a depth of some 50 ft (15 m) about seven miles southeast off Manasquan (NJSPMP 1981 II:100).

Dredging for the Monmouth Beach replenishment project in 1994-1995 off Sandy Hook, New Jersey yielded over 200 prehistoric lithic artifacts. An offshore origin for the materials located on the beach was assumed, prompting archaeologist Daria Merwin (personal communication 2003) to conduct an underwater survey for the associated site. Her study area included the offshore dredged section, which also lies in the general vicinity of several stream channels leading to the submerged Hudson River. Archaeological site patterning on the terrestrial portion of the outer coastal plain in New Jersey indicates that stream channels become a strong predictor for the presence of prehistoric sites. Merwin's initial survey obtained two flakes which were similar to the dredged lithic assemblage, in addition to two mammal bone fragments. The results strengthen the proposition that the materials did originate from a continental shelf location.

Estimations of the potential for site location within the published literature for the Atlantic coastal shelf reveals a range of opinions from low (e.g., Edwards and Merrill 1977) to high or good (e.g., La Porta et al. 1999). Agreement is more consistent on the factors involved in first, the occurrence of landforms likely utilized by humans and secondly, the preservation of any sites associated with the landforms during the Late Pleistocene/Holocene sea level fluctuations. These factors involve a complex interplay among the sea level rise, the paleogeography and inferred human use/ settlement patterns along the continental shelf. The goal is to locate those areas most likely to have survived the erosional effects of the transgressing ocean which would have reworked the surface of the progressively inundated shelf terrain to varying degrees (La Porta et. al. 1999; Stright 1995, 1990). The amount of disturbance at a given location on the shelf, however, is actually highly variable.

In general, the depth of erosion at any point would depend on "impinging wave energy, sediment supply, resistance to erosion, pre-existing topography, tidal range and rate of relative sea-level change" (Belknap and Kraft 1981:430). If, prior to the development of full shoreline conditions at a particular location, there was a deposition of sediments formed in a lower energy environment, such sediments could preserve any underlying sites. This would occur if the thickness of such deposits is greater than the depth of wave scour which occurs as full shoreline conditions develop.

One situation where such a low-energy transgressional environment is created is the development of barrier-lagoon systems, such as those which extend along the south shore of Long Island. Such systems involve the formation of shallow bodies of water behind offshore bars. Deposits of mud and marsh vegetation form during the process of siltation of the lagoon. The gradual inundation which enables the marsh deposits to form would also result in relatively little disturbance to any archaeological sites which may be present. As sea levels continue to rise, the waves eventually attack the offshore barrier and the lagoonal deposits. Erosion resulting from the rising sea level

may not completely remove these lagoonal deposits. Any underlying archaeological site that may be present beneath the deposits would therefore remain undisturbed (Kraft et al. 1983:97).

Kraft et al. (1983:111-112) suggest that lagoon formation would also result in submerged environments at the edges of the marsh where archaeological sites might be found. Such archaeological sites would be the most likely to survive the marine transgressive process.

Long Island Shoreline Submergence - Sea Level Curves. A number of analytical curves have been produced that demonstrate various levels of the sea across time. Such curves are constructed via radiocarbon dating of peat or other organic sediments immediately overlying pre-inundation surfaces. By correlating the age of various samples with the depth below present sea level from which each sample was obtained, curves of sea level rise with time are constructed. Sea level rise is a function of three factors: the world-wide (eustatic) rise in sea level caused by the release of water from glacial ice; the (isostatic) rise in the land surface which occurred as the weight of glacial ice was removed; and any local crustal subsidence that may have occurred. Thus, sea level curves vary with location (Kraft 1985; Newman 1966; Pardi 1983).

The most relevant curve for the south shore of Long Island was published by Rampino (1979) and Rampino and Sanders (1980; see Figure 5). Incorporating data obtained from organic material recovered from cores taken near Fire Island as well as other data from the Long Island area this curve shows an overall steady rate of sea level rise between ca. 7000 and 3000 BP (ca. 5000 and 1000 BC), with a slowing rate of increase after the latter date. Prior to ca. 7000 BP, the rate of sea level rise may have been more rapid, although the small number of data points from this early period makes possible alternative interpretations.

Long Island Shoreline Geomorphological Reconstruction. The barrier-lagoon system along the south shore of Long Island has been studied by Sanders and Kumar (1975), Rampino (1979), and Rampino and Sanders (1980, 1981). These studies are based on analyses of borings and vibracores taken both within the lagoon (Great South Bay) and offshore Jones Beach and Cedar Beach. As noted in Section 2, the strata underlying those formed during the processes of Holocene marine transgression represent deposits laid down during the Pleistocene. Two Pleistocene glacial outwash stratigraphic units, consisting of brown sands and gravels, have been identified. The lower depositional unit is known as the Merrick Formation and the upper unit, which constitutes most of the surficial deposits on southern Long Island, as the Bellmore Formation. At some locations a late Pleistocene deposit, the Wantagh formation, is interbedded between the two outwash stratigraphic units. The latter stratum represents material deposited during Pleistocene marine advances (prior to the final advance of the Wisconsin glaciation) and consists of "gray, compact silty clays and silty sands of backbarrier origin (the silty clay facies of the Wantagh Formation), but also contain[s] a lens of coarse- to fine-grained sands of probable barrier-island origin (the sand facies of the Wantagh Formation)" (Rampino and Sanders 1980:1068).

At present the surficial sediments proceeding southward from the Long Island mainland and across the lagoon to a point offshore of the barrier islands represent

- the submerged Pleistocene highland;
- a fringe of brackish-to salt marsh composed primarily of *Spartina* grasses;
- open-lagoonal silty clays;
- backbarrier tidal delta and washover sand lobes;
- backbarrier-fringe salt marshes;
- barrier island sands of beach-ridge, dune, beach-berm and inlet fill origin;
- shoreface sands; and
- inner shelf sands.

Rampino and Sanders (1980) correlate the various Holocene deposits with engineering descriptions as given in various core logs as follows:

> Salt and brackish water marsh deposits —"Meadow mat" or gray to brown peat and gray to black organic silty clay with roots
>
> Lagoonal silty clays—Soft, gray to black, organic silty clays, sometime containing shells or shell fragments. Samples examined in the lab are olive-gray silty clays high in organic material
>
> Backbarrier sands—Medium gray to olive-gray fine to coarse-grained sands. These sands contain shells and occasional layers of organic silt.
>
> Barrier island sands—Very dense, white to light tan, fine to coarse-grained sands with some gravel (usually less than 10%) in places and containing shells.

As discussed below, with a slow rise in sea levels saltmarsh peats or organic silts/clays would have formed in lagoons behind the barrier islands. Rampino (1979) suggests that accumulation of marshy peat deposits as opposed to open lagoonal silts and clays would be related to the rate of submergence, with a slower rate of submergence enabling sedimentation to build the lagoon floor to a level at which marsh grass could become established. He thus relates the development of the extensive salt marshes in the present lagoon to the reduced rate of sea level rise which began ca. 1000 BC (see Figure 5). In either case, the lagoonal peats, silts or clays would immediately overlie any prehistoric archaeological deposits.

In the area immediately north of the present barriers, the peat and lagoonal silts/clays are overlain or mixed with backbarrier sands. Such sands are deposited during storms, leading to the creation of "wash-over fans," or by tidal currents flowing through present or former inlets which deposit "flood-tidal delta lobes."

The submarine surficial deposits offshore of the barriers consist of sand that has been washed from the barrier island by wave action, and a thin (<10 ft [3 m]) layer of reworked continental shelf sand, which typically forms a series of ridges and swales. These sands would overlie the relict backbarrier sediments.

The Holocene deposits were formed as the rising sea levels transgressed the land surface. As the sea inundated the land, barrier islands and lagoons would continue to be interposed between the

ocean front and the retreating mainland (see below). At a given point the surficial sediments, over time, would consist of the types listed above, with each type being replaced by the next in the list. Thus, theoretically the deposits at a given point offshore of the present barrier islands, from bottom to top, would consist of the types of deposits listed above in the same sequence (Figure 36). The repetition in vertical stratigraphic section of the offshore sequence of horizontal environments is known as "Walther's Law" (Rampino and Sanders 1981:41).

Within the above sequence, prehistoric sites, if present, should be located in accumulations of soil which formed during the Holocene prior to marine transgression. These should be located immediately overlying the Pleistocene deposits and beneath the marsh/lagoonal deposits resulting from marine transgressive processes.

Based on an analysis of borings and vibracores, as well as other data, Rampino and Sanders (1980, 1981) published schematic cross sections of the deposits underlying the present lagoon, barrier beach and offshore areas of Cedar Beach and Jones Beach (Figures 37, 38 and 39). The data indicate that in many locations the backbarrier/lagoonal transgressive sequence noted above is preserved wholly or in part within presently submerged portions of the continental shelf. "The backbarrier-lagoonal sequence preserved on the Long Island shelf is up to 8 m in thickness ... in many cores the backbarrier sands in the upper part of the sequence are thin, possibly as a result of erosion in the present nearshore zone. However, some cores contain almost the entire transgressive backbarrier sequence" (Rampino and Sanders 1980:1071).

Rampino and Sanders (1981) suggest that the location of Holocene barrier islands was determined by the presence of pre-existing ridges, possibly representing the remnants of former Pleistocene barrier islands. With rising Holocene sea levels, barrier islands would have formed at such locations as a result of sand being trapped along these ridges. Two processes have been proposed as affecting barrier islands in response to a rise in sea levels: landward migration and drowning in place. Where there is an adequate sediment supply relative to the rise in sea level the barriers would be continually replenished and would remain in place. During this time the sea level rise would cause the lagoon behind the barrier to widen and deepen. If, on the other hand, an adequate sediment supply is not available to match the rate of sea level rise, the seaward side of the barriers would be continuously eroded while at the same time sand would be deposited shoreward of the barrier in the form of washover fans and tidal deltas. The result would be a continuous migration of the barriers landward. Other authors have noted this barrier migration. Swift (1975:38) notes that "the lagoonal carpet of the Central Atlantic Shelf indicates that the modern barriers have retreated to their present positions from the shelf edge during the post-glacial transgression. Thus the immediate genesis of most central Atlantic barriers is a retreat in from the position of its immediate predecessor."

Based on analysis of borehole and vibracore data Sanders and Kumar (1975) and Rampino and Sanders (1980, 1981) argue that both processes affected the Long Island barriers. Their reconstruction reveals that approximately 9,000 years ago, with the sea level at 80 ft (24 m) below present mean sea level (MSL), a chain of barrier islands existed some 4 miles (7 km) south of the present barriers. The supply of sediment relative to sea level rise was apparently sufficient for these

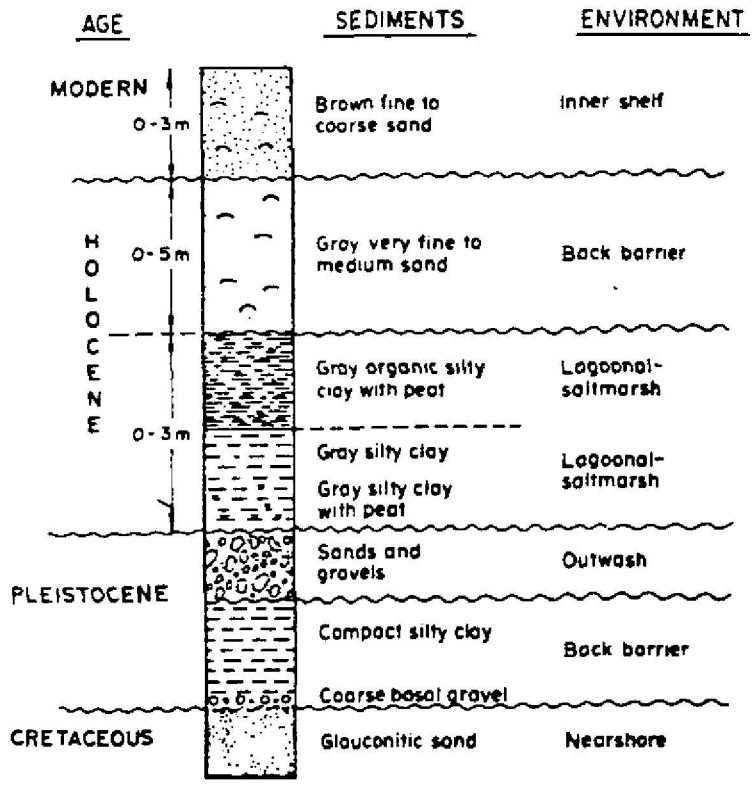


Figure 36. Generalized profile of Holocene deposits from vibracores off south shore of Long Island. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Rampino and Sanders 1980:1071).*

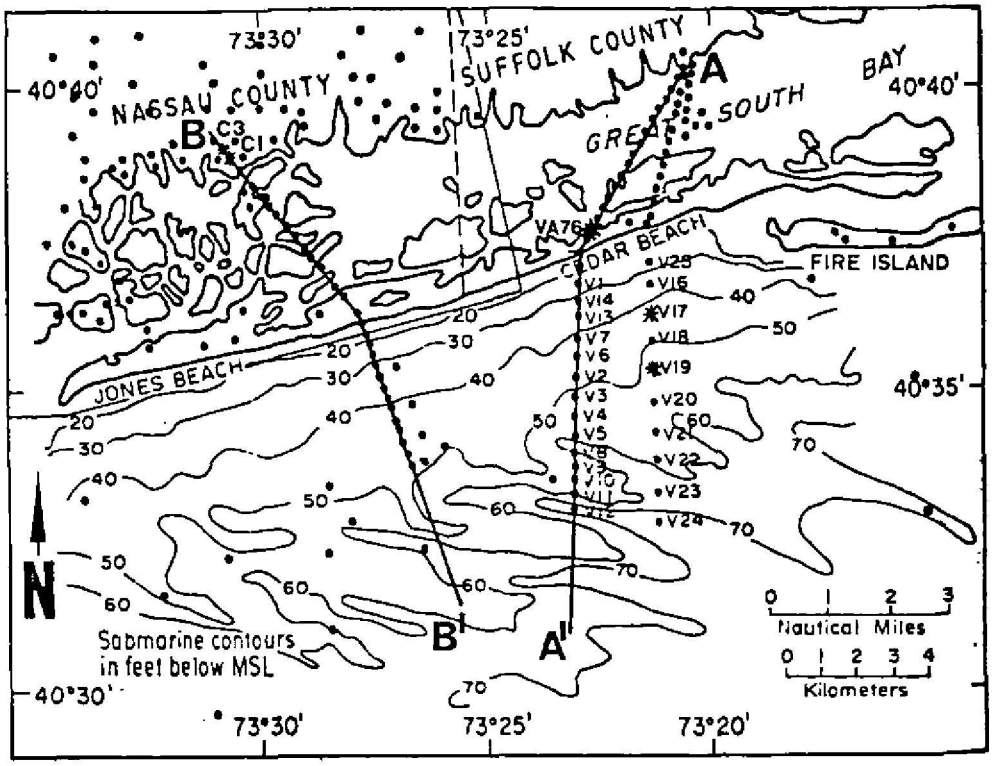


Figure 37. Locations of vibracores and borings and reconstructed cross sections. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Rampino and Sanders 1980:1064).*

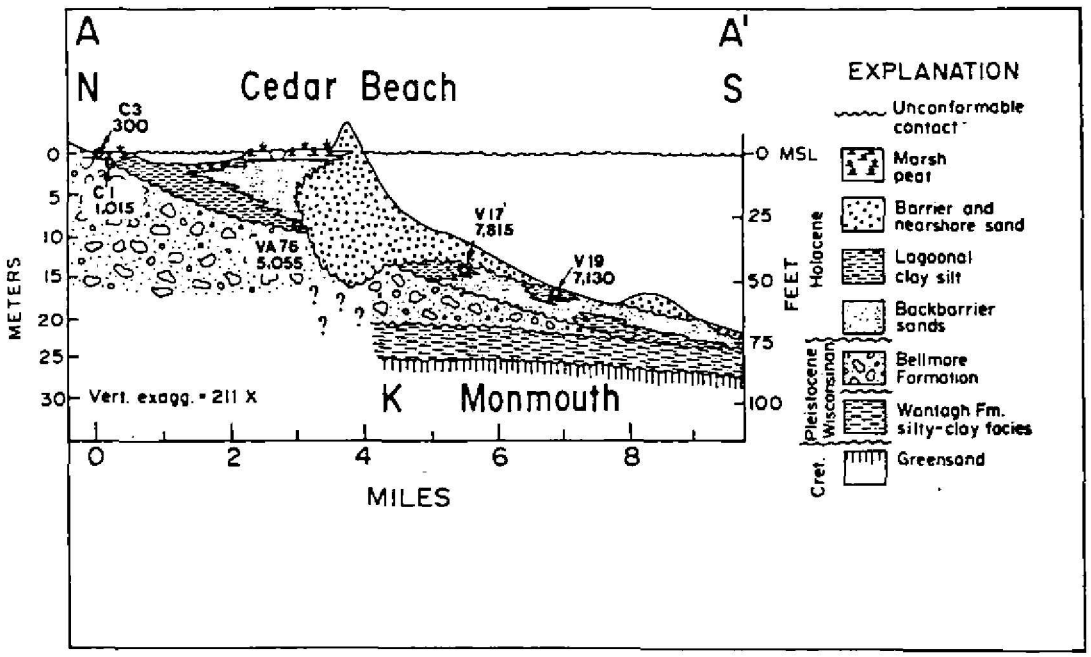


Figure 38. Reconstructed off-shore cross-section in Suffolk County. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Rampino and Sanders 1980:1067).*

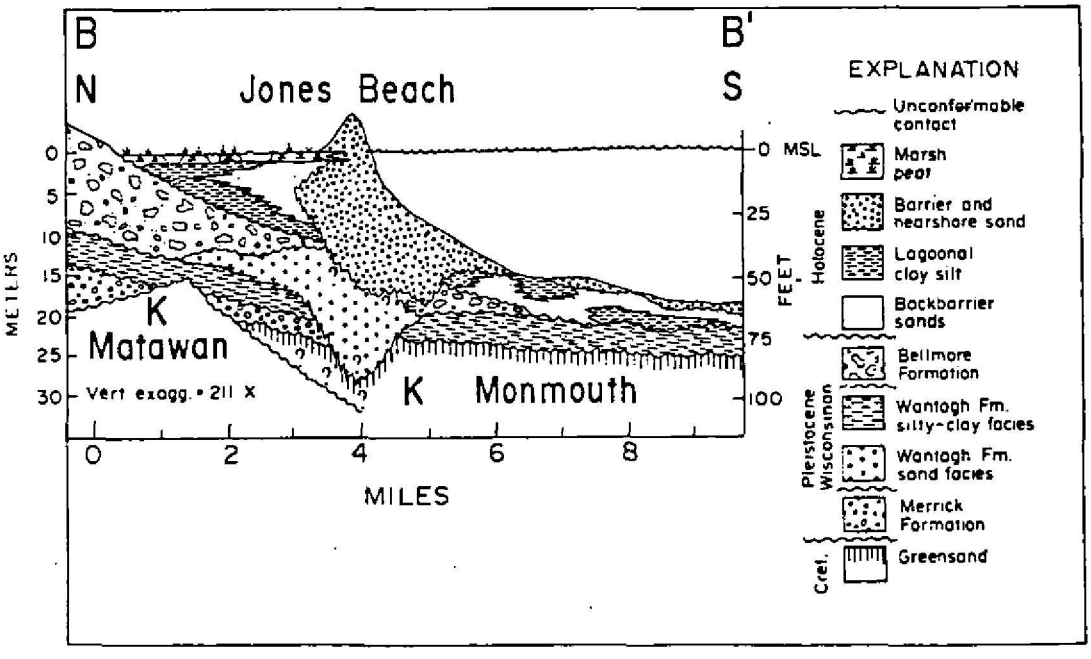


Figure 39. Reconstructed off-shore cross-section in Nassau County. Cultural Resources Assessment of T-Groin Placement, Queens County, New York *(Rampino and Sanders 1980:1067).*

barriers to build upwards with the ocean's rise, with a corresponding increase in depth of the lagoon. During a period of rapid sea level rise just prior to 7000 BP (5000 BC), when the sea level was at -50 ft (-15 m) MSL, the sea apparently reached the top of the barrier. At that time the shoreface moved across the lagoon to its landward side, located approximately 1¼ miles (2 km) offshore of the present barrier islands. A new line of barrier islands formed at this point, which may have been a "ridge" representing the remains of a Pleistocene age coastal barrier as noted above. Subsequent to ca. 5000 BC the barrier slowly migrated to its present position.

The rapid shift of the breaker zone across the 5000 BC lagoon generally resulted in the preservation of the sequence of deposits noted above. At the actual site of the former barrier islands, however, these deposits may not have been completely preserved. At such locations scour from laterally migrating inlets would have resulted in partial or total disturbance of the transgressive sequence.

Sanders and Kumar (1975) and Rampino and Sanders (1980, 1981) also suggest that the subsequent migration of the 5000 BC barrier shoreward, involving erosion of the shorefront, would have resulted in partial or total disturbance of the transgressive sequence in the 1¼- mile (2-km) area between the location of this barrier and the present shoreline. Their schematic sections (see Figures 38 and 39), however, appear to show areas of lagoonal deposits closer than two km to the present barrier island shoreline (Rampino and Sanders 1980). Descriptions of many of the cores on which Rampino and Sanders based their reconstruction are included in Williams (1976). The descriptions suggest that at least some of the cores located closer than two km to the present shoreline do, in fact, contain portions of the transgressive sequence.

The above discussion suggests that early Holocene ground surfaces could be preserved offshore of the existing beach if such surfaces are overlain with backbarrier lagoonal or tidal marsh deposits in the form of organic peat or organic silts/clays deposited on the floor of the lagoon (the early Jamaica Bay) shortly prior to the migration of the barrier beach southward to its present location.

Characteristics of Possible Submerged Site Locations. Assuming that prehistoric archaeological sites could be preserved beneath relict lagoonal peat, silts and clay deposits, the question remains as to where such sites would most likely be located. The desirability of an area as a locus of prehistoric activity would be reflected by its topography and physiography prior to inundation. The likely locations for prehistoric sites on the drowned portions of the continental shelf should reflect the environmental characteristics of known sites on the present shoreline. Thus Edwards and Emery (1977) noted that areas on the continental shelf which may have been attractive to prehistoric inhabitants would be those "with some elevation, with freshwater sources nearby, a variety of plant communities within a short distance, and an abundance of larger game" (Edwards and Emery 1977:253).

Drier areas adjacent to streams and tidal coves that intersected former lagoon shorelines would be especially attractive locations. These environments are similar to those where sites have been reported along the northern shoreline of Jamaica Bay. Such sites could represent fishing or shellfish collecting camps that would be located near former shorelines, or longer-term habitation sites that most likely would be located further inland. Inundated shell heaps representing the former

site type have been identified in marshy areas in and adjacent to existing backbarrier lagoons along the southern coast of Long Island (see Pickman 1993). The shell heap at Bayswater, reported in the early twentieth century, may have been located in this type of environment. Such environments would have existed at the location of the project area when the barrier beach shoreline was south of its present location, and the lagoon shoreline at the location of the present beach and immediate offshore area.

It is uncertain if the channels representing historic period streams and tidal coves intersecting the Jamaica Bay shoreline as shown on historic period maps would have extended further to the south along the continental shelf prior to inundation by rising sea levels or whether such earlier channels would have been in completely different locations. In any event, the relatively small cross section of the historic period stream channels augurs that it may be difficult to locate such drowned channels by remote sensing.

Long Beach Data and Analysis. Records of cores and seismic profiles taken as part of geophysical investigations south of Long Beach were examined by Pickman (1993) as part of the cultural resources reconnaissance for the East Rockaway Inlet to Jones Inlet beach erosion control project. These geophysical data were obtained from proposed borrow areas for that project, which extended between 3,000 and 9,000 ft (915 and 2,745 m) south of the Long Beach shoreline. The results of the seismic investigations revealed the presence of a clay stratum in a portion of the area investigated. The geophysical investigation reported that

> The clay reflector ranges in depth between approximately 45 to 60 feet [14 to 18 m] below sea level. In areas closer to the inshore line the clay reflector could only be inferred to exist. The problem of identifying the seismic clay reflector in some areas is due to masking by a water multiple reflection.... The weakness in correlating the real clay layer with the seismic clay reflector is that the clay layer was encountered in only one core [Alpine Ocean Seismic Survey 1992:12-13].

This clay layer was also identified in the records of two pipeline borings noted by Williams (1976) (see Pickman 1993:46). The depth of the clay layer as reported in the borings and the seismic profiles was approximately consistent with the depth of the Holocene relict lagoonal deposits discussed by Rampino and Sanders (1980).

Interpretation of the deposits noted in core logs is complicated by the fact that these records often fail to note the presence of organic materials characteristic of backbarrier lagoonal and tidal marsh deposits.

> The engineering core descriptions apparently do not always indicate the presence of organics. For example the silts and clays indicated in most of the core descriptions included in Williams (1976) are not indicated as having an organic content. However, examination of the material from these cores by Rampino and Sanders, as discussed above, indicated the presence of such material. In fact the descriptions of cores V-17 and V-19 (Williams 1976:100-101), from which radiocarbon dates were obtained from organic material, did not mention the presence of organics [Pickman 1993:47].

Rockaway Offshore Cores. Geophysical investigations were conducted for a beach erosion control project extending from Rockaway Inlet to East Rockaway Inlet (USACE 1974). Cores were taken in borrow areas for this project extending between one and 1¾ miles (1.6 and 2.8 km) offshore of Rockaway Beach. Only one of the twelve initial cores taken for this project encountered a deposit of clay at a depth of roughly 60 ft (18 m) below present sea level, representing possible lagoonal deposits. This boring was located west of the project area and approximately 8,000 ft (2.4 km) offshore. The boring nearest to the project area was located some 6,500 ft (~2 km) south of its western end. It reached a depth of 60 ft (18 m) below sea level without encountering possible lagoonal silts and clays.

Several cores, however, were taken offshore of the project area subsequent to the initial series. Two of these encountered strata that could represent deposits associated with relict backbarrier lagoons. Boring 3, located 5,000 ft (1.5 km) offshore of the approximate location of Beach 41st Street (just west of the western end of the project area), encountered a thin layer of peat, several inches in thickness, at approximately 49 ft (15 m) below sea level. Boring 2 was located slightly east of the project area approximately at the line of Beach 22nd Street. About 4,800 ft (~1.5 km) off-shore, the boring encountered a 2.3-ft (70-cm) thick layer of gray silty clay beginning at 31½ ft (9.6 m) below sea level, followed by more than a foot of peat.

The available sources do not include descriptions of cores or other remote sensing data from the beach or immediate offshore areas which would be affected by the proposed T-groin construction. The results of borings taken further offshore, as described above, show that it is possible that backbarrier lagoonal deposits and any underlying deposits remain intact at least for some locations.

3.4 Potential for Submerged Historic Sites

While no known historic shipwrecks have been reported from the project area and none are visible on the present ocean floor in shallow water conditions, the possibility of more deeply buried wrecks needs to be examined. A number of documentary studies and underwater surveys pertaining to the south shore of Long Island (discussed below) reveal four important considerations:

(1) As part of New York Harbor, the area has long experienced a high volume of shipping and concomitantly a high degree of shipwrecks

(2) Many wrecks, whether or not considered eligible to the National Register of Historic Places, have gone unrecorded

(3) Remote sensing surveys commonly find various anomalies near/offshore Long Island's southern boundary with the Atlantic Ocean. Frequently these anomalies represent modern or commonly occurring post-1900s materials such as buried cables, modern anchors or steel drums. Even when anomalies represent non-significant cultural resources, their potential detrimental effect on shipping and underwater construction must be considered.

(4) Recommendations include (but are not limited to):
a) no further work when modern remains are encountered or probabilities of locating buried resources are low;
b) monitoring or remote sensing surveys when such probabilities are greater than low or unknown; and
c) avoidance or inspection of known or possibly submerged significant cultural resources.

A remote sensing survey (i.e., magnetometer and side scan sonar) was conducted at two proposed borrow sites measuring 2,000 by 1,800 ft (Borrow Area 1B) and 2,000 by 1,600 ft (Borrow Area 1A) (Riess 1993). The two areas are located at the New York Harbor entrance, some 4,000 ft north of the Ambrose Channel, some 12,000 ft south of Coney Island and some 12,000 ft southwest of Rockaway Point. The results of the investigation included an assessment as to the high potential for historic wrecks of both large and small water craft within or near the project area; the identification of one potentially significant cultural resource representing one or more possible wooden hulled ships with large metal objects like an engine or cargo; and the recording of ten possible cultural resources of ferrous components, but whose description and significance could not be determined without further investigation. Riess recommended avoiding the eleven magnetic anomaly areas during dredging operations with an appropriate buffer zone. He considered the identified objects as hazardous to the dredging equipment and that most of the anomalies are likely to be insignificant modern debris.

Panamerican Consultants, Inc. (Krivor 2000) conducted a remote sensing survey and diver investigation of 18 of 34 previously identified magnetic anomaly targets for a beach enrichment project. This borrow area measured 6,000 by 3,000 ft (1,830 by 915 m) and is located 7,000 ft (2,133 m) south of the Rockaway Beach shoreline. A review of the navigation history of New York; previous studies in the general project area; the settlement history and management of Rockaway Beach, and the shipwreck inventory off Coney Island, Rockaway Beach and Long Beach, led Krivor to conclude that "...the potential for wrecks off of Rockaway Beach remains high .... Vessel types spanning every era in American history have traversed the waters off New York, making it a haven for a variety of shipwreck sites, many still undocumented and unidentified" (Krivor 2000:22, 27). All 18 of the 34 targets turned out to be modern remains—concrete/rebar bridge boulders and buried or exposed wire/steel cable. No further investigation was advised. Krivor notes that the results are similar to other areas where modern usage of a waterway is heavy. The expectation is that a large number of anomalies will be detected and that of these most will date from the recent past.

Kopper's 1979 documentary and limited surface/subsurface survey of the East Rockaway Inlet area has been mentioned in Section 3.3. The project area consisted of Rockaway Beach between Beach 19th and Beach 149th Streets, the east jetty at the west end of Atlantic Beach, the East Rockaway Inlet navigation channel and offshore borrow areas. A Phase IB survey of the Rockaway and Atlantic Beach shorelines was conducted, but no underwater survey or coring was carried out. Kopper listed the known shipwrecks off Rockaway Beach and suggested that although no known shipwrecks were within the project area, the potential for buried significant vessels existed. He

concluded that the dredging of inlet sands and the disposal of the material on the beach should not impact any known or unknown important sites, although dredging might expose unknown prehistoric sites or shipwrecks; therefore monitoring or a remote sensing survey is recommended before dredging operations begin.

Panamerican Consultants, Inc. conducted a terrestrial survey (Tuttle 1999) of the tidal zone (2,900 ft long) and a magnetometer study of the immediately adjacent offshore area (300 ft from shoreline) off Norton Point on the east end of Coney Island. Tuttle's (1999) research identified the remains of piers within the study area and six shipwrecks off Coney Island with one located in or very near the study area. Water depth varied from 0 to 20 ft. Five anomalies were recorded: riprap remains along the shoreline; a modern dock with a metal derrick arm; two instances of pier remains with pier piles protruding from the water and extending onto land at low tide; and associated off-shore components of one of the pier remains. The first four magnetic anomalies were readily identifiable on shore and confirmed by the magnetometer survey, while the fifth was identified solely by means of the magnetometer. Tuttle agrees with previous investigators who point out that in areas where modern commercial traffic and historic use of waterways has been heavy, a considerable amount of modern material must be anticipated. He concludes, given this expectation and his survey results, that no significant resources should be affected and no further work need be undertaken.

While 33 vessels have been wrecked off Long Beach, none have been recorded for the project area, although six shipwrecks are within the vicinity. A borrow area 20,000 ft long by 4,000 ft wide (6,100 m by 1,220 m) located one mile (1.6 km) off the eastern portion of Long Beach was the object of a remote sensing survey (i.e., magnetometer, side scan sonar, subbottom profiler) conducted by Panamerican Consultants, Inc. (Tuttle and James 1996). Their survey yielded 19 magnetic anomalies of which four probably represent sections of pipe and 13 appear to be modern debris or geologic features. The remaining two were designated potentially significant cultural resources. The authors discuss the link between a historic/modern heavily-used waterway with a high-depositional incidence of culturally unimportant material resulting in a high frequency of anomalies. They recommend avoidance or investigation of the two potentially significant resources and no further work for the remaining targets.

An underwater investigation was conducted by Panamerican Consultants, Inc. (Mitchell et al. 1996) to determine National Register eligibility of four shipwreck sites off Long Beach Island. Examined were an unnamed tugboat in shallow water off Point Lookout at the east end of the island; the *Mexico* and an unnamed wreck somewhere off the island; and an unnamed barge. The point is made that in ocean surface or near surface conditions, just as in the beach zone, the probability of finding intact portions of vessels above the seabed floor is normally low due to the action of factors such as sand erosion, heavy winds and current. The tugboat was the only vessel located; it lay 1,100 ft off Point Lookout in 10-15 ft of water and was found not eligible to the NRHP. The wooden barge was last seen seven years prior to the investigation in 10-15 ft of water some 50-75 ft south of the western tip of the island. The barge was not relocated, perhaps because the vessel had silted in as the East Rockaway Inlet has shifted west over time, and is probably not

eligible even if found. The *Mexico* was considered eligible and a remote sensing survey was recommended. The unnamed wreck could not be located and therefore not assessed.

Panamerican Consultants, Inc. (Tuttle and Mitchell 1998) followed up the investigation of the four shipwreck sites (see Mitchell et. al. 1996) with a magnetometer and side scan sonar survey of virtually all of Long Beach Island. The project area was approximately 41,000 ft (~12,200 m) along the near shore zone, and some 1,500 ft (450 m) offshore in water depths of 7-30 ft. The probability of encountering prehistoric resources was estimated to be low while historic resources/ shipwrecks were considered high. Most anomalies proved to be modern and were found to be related to the heavy maritime traffic in the region. Of the 50 magnetic anomalies recorded, 23 were determined to not represent significant cultural resources; a cluster of three anomalies may represent the *Mexico* at depths of 12-21 ft; one anomaly could be a tug at a depth of 17 ft; 20 of the anomalies were considered to be potentially significant cultural resources now buried; two exposed targets were noted; and the tug from the 1996 study was relocated. Tuttle and Mitchell (1998) advised avoidance or sand burial for the twenty potentially significant targets, and the investigation of the three exposed anomalies before burial, that is, the *Mexico* site and two others.

Two borrow areas—measuring 3,600 by 1,400 ft and 3,600 by 2,100 ft (1,100 by 426 m and 1,100 by 640 m)—located one nautical mile south of Westhampton Beach (near Fire Island) underwent a remote sensing survey (Riess 1994). Again, although no known shipwrecks within the project area had been recorded, the potential for these types of resources was recognized. Six possible cultural resources were located in one of the borrow areas, and none in the other. Riess recommended either avoidance of the target areas with a buffer zone during sand extraction operations or inspection before dredging began.

A literature review, pedestrian survey of land areas above water, a side scan sonar of underwater areas to be impacted with scuba diver inspection of any targets was undertaken by Moeller and Murphy (1980) for Moriches Inlet, at the east end of Fire Island. No prehistoric or historic sites were recorded within the project area, although one unidentified prehistoric point was noted as were a number of shipwrecks in the general Moriches Inlet area. The surface and surface inspection along the east and west sides of the inlet yielded no prehistoric/historic materials or sites, only modern remains. The underwater survey and diving inspection resulted in the discovery of five targets: Target A, a heavy submarine cable partially buried in the ocean floor; Target B, a vessel, most likely the *Gates City* with some remains above the sand and within six feet of the water surface; Target C, a mast or spar above the sand, which might be a sailing ship; Target D, the *Franklin,* evident above the sand with remains breaking the surface of the water at low tide; Target E, a modern hull, part of which is visible above the sand. Moeller and Murphy (1980) advised additional research on the mast/spar site to see if the remains represent a shipwreck and the location of the *Gates City* on navigation charts

The Greeley-Polhemus Group, Inc. compiled a list of shipwrecks for the near-shore area between Fire Island Inlet at the west end of Fire Island and Moriches Inlet in 1998. From 1657 to 1985, 155 shipwrecks from both near-shore and off-shore zones were identified. "Undocumented shipwreck

losses in the vicinity are not part of this inventory, but the potential number of such sites far exceeds the list of known shipwreck sites in the Long Island Atlantic coast near shore tidal zone" (Greeley-Polhemus Group 1998a:8). Determining a high potential of finding potential resources, the authors recommended a beach/tidal zone and underwater survey of the project area, even though there were no known historic shipwrecks nearby.

The Greeley-Polhemus Group (1998b) expanded their investigation of Fire Island to include the rest of the south shore of Long Island to Montauk Point for a total of 83 miles (132 km). Their Phase IA study consisted of a comprehensive review of information relating to the assessment of site potential for prehistoric, historic and historic architectural resources. Data and issues covered in their subsequent report have also been discussed in the present investigation. Study results included: the identification of 14 recorded sites on the barrier island (12 historic and 2 prehistoric); the recovery of six flakes and chalcedony shatter from one shovel test in an area of disturbance during a limited terrestrial survey of 4,000 ft (1,219 m) west of Shinnecock Inlet; and increasing the number of near and off-shore wrecks within the project area to 453. The authors restate their supposition that numerous shipwrecks have gone unrecorded and advise that the same type of beach/tidal zone and underwater survey be extended to the entire shoreline along Fire Island to Montauk Point.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 CULTURAL RESOURCES—EXISTING BEACH ZONE AND ADJACENT SEA FLOOR SURFACE

The archaeological sensitivity of the beach and ocean floor surfaces of the project area result from the interplay of the natural processes affecting the beach zone as well as the history and prehistory of the Rockaway peninsula.

Prehistoric Period. No prehistoric or contact period occupations or archaeological sites on Rockaway beach have been reported. A prehistoric shell heap and other deposits were reported at the beginning of the twentieth century in the Bayswater area, on the Jamaica Bay side of Rockaway peninsula, but these sites are not in the vicinity of the proposed project.

As discussed in Section 2, the exposed nature of the existing beach zone would probably not have made it an attractive location for permanent or semi-permanent prehistoric Native American occupation sites. Although temporary use of the beach zone for resource procurement is indeed possible, the natural processes involved in shoreline erosion would normally remove or severely disturb any *in situ* archaeological materials. The prehistoric artifacts reported from Rockaway Beach, or any additional material from this beach zone is more likely to represent remains from disturbed (e.g., dredged beach fill or wave/storm deposits) than original contexts.

Similar assessments of the potential for surface or near surface prehistoric material from comparable environmental zones have been made by other researchers. Kopper (1979) estimated the probability of prehistoric remains in exposed beaches (underwater or above water) as low and specifically Rockaway Beach as very low. The authors of the Greeley-Polhemus Group report (1998b) also considered a low probability. Moeller and Murphy provide a succinct summary of cultural resource preservation under changing or unstable shoreline conditions (quoting almost verbatim from Kopper 1979:4): "In such an environment surface and near beach accumulations of artifacts, shell, and other food debris, and even small features of human manufacture tend to become buried, reexposed, and dispersed or destroyed under the action of storm waves" (Moeller and Murphy 1980:29).

Historic Period. Prior to the late-nineteenth century only life saving stations and one or two houses had been built on Rockaway beach west of Far Rockaway. None of these structures were in the vicinity of the present project area. The beachfront in the Edgemere portion of Rockaway Beach was not developed until the 1890s when the Edgemere Hotel was constructed. During the first decade of the twentieth century, several domestic structures and additional hotels and bath houses were erected along the beachfront. Analysis of shoreline changes reveals that all of these structures were located north of the area of proposed project impacts. Examination of historic maps suggests that two associated features extended southward into the present beach zone to more than 50 ft (15 m) seaward of the existing boardwalk. One of these features was a pier at Beach 38th Street constructed between 1901 and 1912 and associated with domestic structures built along the beachfront during this period. The other feature was an L-shaped groin constructed between 1912 and 1917 at Beach 36th Street in front of the Edgemere Hotel.

A pier (built ca. 1901-1912) was located east of the existing stone groin and site of the proposed new construction. Any buried remains of the Edgemere Hotel groin at Beach 32nd Street would be located near the site of the existing stone groin and proposed T-groin. Construction of the on-shore section of the proposed T-groin would involve only the driving of piles, which might impact any existing buried pilings in this area.

The groin remains noted along the beach during the site visit are most likely associated with the series of groins constructed between 1926 and 1930. These and the later stone groins at the western end of the project site are the only structures now visible within the project area.

Although historic period buildings (e.g., hotels, bath houses) and structural features (i.e., groin, pier) are known from in and near the beach zone section of the project area, no visible surface remains were noted during the field reconnaissance. The shallow water depth immediately offshore would make identification of historic or any type of cultural resources at or near the present ocean floor relatively simple; none were observed.

Shipwrecks comprise the second class of historic period resources that may be encountered. The results of a number of underwater surveys along the entire Long Island south shore attest to the significant amount of materials that may be found from heavy maritime traffic combining with stormy seas to produce an high incidence of historic and modern shipwrecks. The south shoreline is also frequently employed as a location for buried cables and other forms of modern underwater contruction/debris (e.g., artificial reefs, trash). The probability that such materials, be they modern or historic in origin, will be found in the project area, we consider is medium to high. The importance of locating any resources rests on the necessity of protecting any significant cultural remains and in determining the potential negative impact to the T-groin construction operation.

4.2 Cultural Resources—Offshore Zone

Presently available data indicate the possible presence of buried *in situ* archaeological sites within the project area. These sites, dating to the earlier portion of the prehistoric period, prior to the formation of the barrier beach at its present location, could be located within the offshore portion of the project area.

Geomorphological analyses reported in the literature disclose that a sequence of barrier islands were present off the southern shoreline of Long Island during the prehistoric period. These barriers migrated northward across the continental shelf, eventually reaching their present locations. Two cores located between 5,000 and 6,000 ft (1,525 m and 1,830 m) south of the project area beach reveal the presence of peat and/or silts/clays that may have been deposited within the lagoons that formed behind these earlier barriers. These deposits were encountered at depths of approximately -31.5 and -49 ft (-9.6 and -15 m).

The presence of lagoonal sedimentary deposits would reflect that inundation of the prehistoric ground surface at the location of such deposits occurred in a relatively low energy environment and

that any prehistoric sites located in these areas prior to inundation could have survived the processes associated with marine transgression. None of the remote sensing data reviewed or extant for this project, however, was obtained from the immediate nearshore or beach zones in the vicinity of the project area and no core samples have been taken. Therefore, it is not known if relict backbarrier lagoonal deposits and the underlying strata remain intact.

Plans for the proposed T-groins indicate that the base of these groins will be at a depth of 12 ft (3.7 m) below the National Geodetic Vertical Datum (or 3-4 ft below the current sea floor). The sea level curve supposes that any site present at this elevation would have been inundated ca. 3500 BP (1500 BC). Submerged environments most likely to contain prehistoric sites dating to the early portion of the prehistoric period (i.e., Paleo-Indian or Early Archaic sites) probably would be located further offshore of the existing beach and would therefore not be impacted by the present project.

A thorough analysis of the sensitivity of the areas of proposed project construction for the presence of drowned prehistoric sites would require further geophysical investigations. Cores reaching depths below those of anticipated project impacts would reveal whether backbarrier lagoonal deposits are preserved in the project area. If such deposits exist in the areas to be excavated, it would remain to be determined whether any prehistoric sites are actually present at these locations. This assessment would involve examination of material from cores within the actual impact areas, or acquisition of seismic data sufficient to reconstruct the pre-inundation topography and physiography of the area.

Given the lack of existing seismic and coring data for the project area, the likelihood that an undisturbed prehistoric site from an appropriately associated submerged landform would be impacted by the proposed T-groin excavations cannot be definitively determined. Nonetheless, the depth of the T-groin construction relative to probable prehistoric site/landform location depths greater than these renders the actual likelihood as low.

4.3 RECOMMENDATIONS

Probability assessments of cultural resources for particular zones within the project area are included as Table 3. The likelihood of locating prehistoric sites on the beach or present ocean

Table 3. Probability Assessment of Cultural Resources

Location and Type of Possible Cultural Resource	*Assessment/Recommendation*
Beach/Adjacent Current Ocean Floor Surface	
Prehistoric landform/site	low, none visible; no further work
Historic resources	formerly present, none visible; no further work
Subsurface Beach/Submerged Ocean Floor	
Prehistoric site/landform	low; no further work
Historic resources (e.g., shipwrecks)	medium to high; Phase IB Survey

floor is considered low, due primarily to unstable and migrating shoreline conditions. A low likelihood does not imply that sites or evidence for sites cannot be found as indicated by the report of prehistoric artifacts (although not *in situ*) being recovered from the study area portion of Rockaway Beach. The pier and groin from the early 1900s were associated with the Edgemere Hotel and domestic structures, but no above-surface beach zone remains are extant. No shipwrecks are known or were observed in shallow water conditions immediately offshore. We consider it unlikely that the T-groin construction will impact any significant cultural resources from the surface or near-surface portions of the project area and no further work is advised.

The likelihood of encountering prehistoric landforms/sites beneath the beach and present ocean floor could not be definitely estimated, given the lack of appropriate geophysical data specific to the project area. Assuming the relative depth calculations of the T-groins are correct, the construction is unlikely to affect the type of prehistoric resources that would be buried much deeper. Hence, a low probability assignment and a recommendation of no further work (e.g., coring or seismic profiling). The below-surface remains of the early-1900s pier and groin are presumably still present. The southern coast of Long Island, including the project area, is susceptible to historic and modern shipwrecks and serves as the location of other forms of modern materials. The probability of locating both modern and historic cultural resources is medium to high and a Phase IB underwater survey (i.e., magnetometer and side scan sonar) is recommended in order to locate the most likely potential resources representing the remains of the structural features associated with the turn of the century beach front buildings and possible shipwrecks.

The New York State Office of Parks, Recreation and Historic Preservation (State Historic Preservation Office) concurs with the recommendations presented in the report.

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WES [Waterways Experiment Station, U.S. Army Corps of Engineers]

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APPENDIX A
OPRHP CORRESPONDENCE

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

Bernadette Castro
Commissioner

August 11, 2003

Nancy Brighton
US Army Corps of Engineers
Jacob Javits Federal Building
New York, NY 10278-0090

Dear Ms. Brighton:

Re: CORPS
Rockaway Beach Project
T-Groing Placements
Brooklyn, Kings County, New York
03PR03715

Thank you for requesting the comments of the State Historic Preservation Office (SHPO) with regard to the potential for this project to affect significant cultural/historical resources. SHPO has reviewed the report "Draft Report - Cultural Resources Assessment of T-Groin Placement, Atlantic Coast of New York, East Rockaway Inlet to Rockaway Inlet, and Jamaica Bay, Queens County, New York, Section 934" prepared by Panamerican Consultants, Inc. in June 2000. Based on this review, SHPO concurs with the recommendations of the report for limited Phase 1B underwater investigation .

Please contact me at extension 3291 if you have any questions regarding these comments.

Sincerely

Douglas P. Mackey
Historic Preservation Program Analyst
Archaeology

APPENDIX B

VITAE OF KEY PERSONNEL

PCI BUFFALO • TUSCALOOSA • MEMPHIS • TAMPA

Panamerican Consultants, Inc. • 2390 Clinton Street • Buffalo, NY 14227 • (716) 821-1650 • Fax (716) 821-1607

MICHAEL A. CINQUINO, Ph.D., RPA
Senior Vice President/Senior Archaeologist

EDUCATION

Ph.D. Anthropology, State University of New York at Stony Brook, 1986
M.A. Anthropology, State University of New York at Stony Brook, 1977
B.A. Sociology, St. John Fisher College, Rochester, New York, 1971

EXPERIENCE

Dr. Cinquino is currently Senior Vice President of Panamerican Consultants, Inc. (PCI) and director of the Buffalo (New York) Branch Office. A Senior Archaeologist, he has served as project manager/principal investigator on over 300 cultural resources projects throughout New York, Pennsylvania, New Jersey, Puerto Rico, the U.S. Virgin Islands, and the eastern United States. These projects include natural gas pipelines, fiber optic lines, developments, transportation projects, flood control projects for the U.S. Army Corps of Engineers, light rail rapid transit systems, industrial parks, wastewater treatment plants, fuel storage projects, interceptor sewers, a demolition project, construction monitoring, and U.S. military installations. He prepared numerous cultural resource sections for environmental assessment, impact statements, environmental resource documents, and cultural resource management plans and environmental audits.

He is experienced at conducting cultural resource investigations on large-scale projects including corridor/pipeline and highway projects, military installations, wastewater projects, etc. which often require detailed archival and historic map research, design of field methodology including predictive site modeling strategies, all phases of archaeological field investigations, documentation and report preparation. He has conducted investigations at military installations throughout the eastern United States, Puerto Rico and in the Virgin Islands.

Dr. Cinquino also has extensive regulatory experience on the federal and state levels as State Archaeologist and Review and Compliance Archaeologist for the Puerto Rico State Historic Preservation Office (SHPO) and as a consultant for the New York State Department of Environmental Conservation (NYSDEC) directing the cultural resource review for the NYSDEC permit program and SEQRA compliance. In addition, as an employee of Ebasco, he assisted in report reviews for the Federal Energy Regulatory Commission (FERC).

Dr. Cinquino has over 25 years experience as an anthropologist with expertise in cultural anthropology, prehistoric and historic archaeology, archival and historic research, cultural resource management, and historic preservation. His Ph.D. dissertation research was an ethnographic and ethnohistoric analysis of the religious ceremonial cycle of a peasant village in Western Mexico. He is an experienced interviewer in English and Spanish.

He is a member of the Register of Professional Archaeologists (RPA) and certified in Field Research and Archaeological Resource Management. He is also on the New York State SHPO's list of archaeologists and a member of the New York Archaeological Council certified to conduct all phases of investigations in prehistoric and historic archaeology. Dr. Cinquino has completed the hazardous waste training course and is familiar with archaeological investigations in areas of potential hazard (e.g., hazardous materials, unexploded ordnance).

PROFESSIONAL AFFILIATIONS

American Anthropological Association:
- Archaeology Division
- Culture and Agriculture Group
- American Ethnological Society

New York Archaeological Council (NYAC)
- Board Member, 1995-1997, 1999-present

Northeast Historical Archaeology
Society for American Archaeology
Society for Historical Archaeology
Puerto Rican Association of Anthropologists and Archaeologists
Register of Professional Archaeologists (RPA)

ADDITIONAL TRAINING

USEPA Hazardous Waste Site Investigation Training Course
- Ecology and Environment, Inc., July 1985
- Ebasco Environmental, May 1992 (update/review)
- Panamerican Environmental, Inc., 2002 (update/review)

REPRESENTATIVE PANAMERICAN CONSULTANTS, INC. EXPERIENCE (APRIL 1993 TO PRESENT)

Dr. Cinquino serves as project manager for PCI's contract and subcontracts with the New York District, U.S. Army Corps of Engineers (USACE). PCI has conducted more than 75 cultural resources investigations for the New York District (some under subcontract), including preparation of integrated cultural resource management plans (ICRMPs) for Watervliet Arsenal, Albany County, New York; Rotterdam Housing Area of Watervliet Arsenal, Rotterdam, Schenectady County, NY; Fort Hamilton, Brooklyn, Kings County, NY; and Picatinny Arsenal, Morris County, New Jersey. PCI also has prepared under Dr. Cinquino's direction an archaeological sensitivity model for Picatinny Arsenal, Dover, NJ as well as six archaeological and/or structural investigations at Picatinny Arsenal; two cultural resource investigations for the Joseph G. Minish Passaic River Waterfront Park in Newark, NJ; 18 archaeological and/or structural investigations at the U.S. Military Academy (USMA) at West Point, Orange County, NY; and six cultural resource investigations (including structural evaluations) at the Green Brook Flood Control Project in northern New Jersey.

Dr. Cinquino has served as Principal Investigator or Project Director for more than forty (40) cultural resource investigations for proposed cellular communications tower projects for URS Corporation. Project areas for these investigations include locations in the following New York State counties: Erie, Cattaraugus, Chautauqua, Steuben, Seneca, Cayuga, Onondaga, Jefferson, and Madison. The investigations included archival and documentary research; systematic survey of the project areas; and report preparation.

In addition, he served as Project Director and Co-Principal Investigator for cultural resources investigation of 16 wetland restoration areas in Central and Northern New York. Conducted for the Natural Resources Conservation Service, these investigations were conducted for sites in Broome, Jefferson, Madison, Montgomery, Oswego, Otsego, Lewis, Oneida, and St. Lawrence counties.

Dr. Cinquino serves as PCI's Project Manager and/or Principal Investigator for pipeline projects conducted for National Fuel Gas Supply Corporation (NFGS) in Pennsylvania and New York (under contract to Northern Ecological Associates, Inc.). PCI's projects for NFGS include a Phase I cultural resource investigation of the proposed Northwinds natural gas pipeline route from Fuhrmann Boulevard in the City of Buffalo south to Zenner Road in the Town of Eden (approximately 18 miles), within the Cities of Buffalo and Lackawanna and the Towns of Hamburg and Eden, Erie County, NY and a Phase I investigation for the proposed Northwinds pipeline in the Towns of Allegany and Hebron, Potter County, PA. Other investigations included a Phase I for the proposed Line X-M10 installation in the Town of Pendleton, NY; a Phase I for the proposed Line S-43 replacement in the Summit Township, Erie County, PA, and a Phase I for the proposed Line K replacement in the Town of Orchard Park, Erie County, NY.

Dr. Cinquino also serves as project manager for PCI's service contract with Niagara Mohawk Power Corporation (NiMo). Investigations include an Historic American Engineering Record (HAER) documentation of a nineteenth century former coal gas holder house at the NiMo substation facility in Saratoga Springs, New York; and archaeological monitoring along a gas line placement next to an historic cemetery in eastern New York (Albany area).

He served as project director for a Phase IB cultural resource investigation of the proposed 15-foot wide, roughly 35-mile long, fiber optic cable route right-of-way between the Town of Hudson, Columbia County, and the Town of Pleasant Valley, Dutchess County, New York. Prepared for Telergy, Inc., East Syracuse, NY, the investigation was conducted in compliance with the SEQRA, the State Historic Preservation Act (SHPA), and appropriate Federal legislation. Fieldwork was conducted according to the NYAC Standards for Archaeological Investigations. In addition, Dr. Cinquino served as co-principal investigator and project director for Phase IA/B cultural resources investigations for a proposed 26-mile fiber optic conduit between the City of Rensselaer through the remainder of Rensselaer County to the Massachusetts-New York state line, and for a Phase IA/B cultural resources investigation for a 130-mile fiber optic conduit along Routes 22 and 684 from Stephentown, Rensselaer County, NY, to White Plains, NY, the eastern portion of New York State, parallel to the state's borders with Massachusetts and Connecticut.

He also was Project Manager or Principal Investigator for five water/sewer line projects conducted for R&D Engineering: a Phase I cultural resources investigation for the proposed Water District #1 and Sewer District #1 in Union Springs, Town of Springport, Cayuga County, New York; two Phase I cultural resource investigations for the proposed Aurora Water Line in the Town of Aurora, Erie County, New York; and a Phase I/II investigation for proposed sewer line construction, Lake Shore Sewer District, Town of Porter, Niagara County, New York.

Dr. Cinquino served as project director and principal investigator for a Phase I survey at Seneca Army Depot in central New York. Due to the potential for encountering hazardous materials, including unexploded ordnance, the entire field crew was required to undertake hazardous waste training.

He served as principal investigator for the Phase I investigation of a 63-acre site for the proposed public works facility and subsequent Phase II investigation of an historic archaeological site for the Chautauqua County Department of Public Works.

Dr. Cinquino served as principal investigator for the Phase I archaeological investigation of approximately 1,700 acres of Griffiss Air Force Base in Rome, Oneida County, New York and annexes in Niagara County, under contract to Tetra Tech, Inc. The survey was conducted to assess the potential environmental impacts of disposal and reuse of portions of Griffiss Air Force Base. His duties included supervision of field crews,

research design, assessing potential National Register eligibility, report writing and preparation, predictive model design, assisting in field investigations, and preparation of site forms.

He served as principal investigator for the subsequent Phase II investigation of 20 archaeological sites at Griffiss Air Force Base, Rome, NY. Site testing was conducted to determine National Register eligibility of these cultural resources.

REPRESENTATIVE EBASCO ENVIRONMENTAL PROJECT EXPERIENCE (1992-1993)

Federal Energy Regulatory Commission. Responsible for providing technical support to FERC staff, for reviewing cultural resource reports and preparing documentation for FERC certified Environmental Impact Statements and Environmental Assessments. These responsibilities included the review of a Phase III Data Recovery report for a multi-component site in Alabama for Transcontinental Gas Pipe Line Corporation's Southern Expansion Project; review of the Phase I cultural resource reports for the West-East Pipeline Company in Louisiana and Mississippi; the preparation of cultural resource sections for the FERC Environmental Impact Statement for this project; and review of a Phase III research design for data recovery work in Colorado for Northwest Pipeline Corporation.

For a two-week period, performed a daily quality control field inspection of the ANR Pipeline's archaeological monitoring of the mechanical stripping of the plowzone at two archaeological sites. This portion of the Centra Gas Transmission Pipeline project is located adjacent to Lizard Mound County Park (listed on the NRHP) in Washington County, Wisconsin. Per FERC's requests and with approval of the Wisconsin SHPO, the fifty-foot wide proposed pipeline ROW was mechanically stripped for approximately 1,600 feet in search of effigy mound remnants and prehistoric burials. In addition to inspection, responsibilities included preparation of a formal field inspection report describing the stripping process, evaluation of field methods and recording techniques, recommendations concerning NRHP's eligibility and a treatment/data recovery strategy of the two prehistoric burials discovered during the stripping process.

U.S. Environmental Protection Agency. As co-principal investigator assisted in field inspection, site file search, and report writing for the Stage IA Cultural Resource Survey, Olean Superfund Site, Olean and East Olean, Cattaraugus County, New York. The investigation included the inspection of 13 separate sites including factories, oil storage facilities, a private dump, a borrow pit, and a residential area where the USEPA is conducting remedial investigations.

New Jersey Water Supply Authority, Lumberville Wing Dam Rehabilitation Project, Delaware River between Hunterdon County, New Jersey and Bucks County, Pennsylvania. As Field Task Leader conducted and directed field documentation of the 19th century wing dam including profiles, measurements, and photographic documentation in compliance with New Jersey State Historic Preservation Guidelines. Also assisted in report preparation.

City of New York, Department of Environmental Protection, Reconstruction of the East of Hudson Dam and Controlled Lakes. Responsibilities included serving as Task Leader for cultural resource issues and architectural redesign and interfacing with State and City review agencies. Prepared photographic documentation and collected historic materials of the dams for National Register of Historic Places eligibility evaluation by the New York State Historic Preservation Office.

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MICHELE HELENE HAYWARD, Ph.D., RPA
Senior Archaeologist

EDUCATION

Ph.D. Anthropology, The Pennsylvania State University, 1986
M.A. Anthropology, The Pennsylvania State University, 1975
B.A. Anthropology, Beloit College, 1972

EXPERIENCE

Dr. Hayward has more than twenty (20) years of experience conducting archaeological investigations and cultural resource management (CRM) projects throughout New York state, New Jersey, and the eastern United States as well as the Caribbean, Mexico, and Central America. She is currently a Senior Archaeologist with Panamerican Consultants, Inc. (PCI), and serves as Laboratory Director at PCI's Buffalo Branch Office. As principal investigator and field director for all levels of archaeological investigations, her duties include reconnaissance surveys and preliminary and intensive data recovery excavations of prehistoric and historic sites; archival research; and historic and prehistoric data analysis. She has comprehensive experience in report preparation and proposal writing as well as designing archaeological field strategies at all levels

Dr. Hayward has served as Principal Investigator and Co-principal Investigator for ten (10) cultural resource investigations at the United States Military Academy at West Point, Orange County, New York. Conducted for the New York District of the U.S. Army Corps of Engineers under subcontract, these investigations included Phase I cultural resource surveys for the Cadet Library Annex, Stewart Army Subpost, Gross Olympic Center, Bull Hill Road Extension, former Married Junior Officers' Quarters (Building 124), timber harvests at Turkey Mountain-Long Pond, Firebreak 2, and Range Road 22, Hurricane Floyd timber sale areas, and the Stony Lonesome Road By-Pass.

She has also served as Principal Investigator for six (6) cultural resource investigations for proposed cellular communications tower projects for URS Corporation. Project locations for these investigations include the following New York State counties: Erie, Cattaraugus, Chautauqua, and Steuben. The investigations included the supervising archival and documentary research; directing the systematic survey of the project areas; and report preparation.

In addition, she served as Laboratory Director for the cultural resources investigation of sixteen (16) wetland restoration areas in Central and Northern New York. Conducted for the Natural Resources Conservation Service, these investigations were conducted for sites in Broome, Jefferson, Madison, Montgomery, Oswego, Otsego, Lewis, Oneida, and St. Lawrence Counties.

Her experience in CRM consists of both reviewing projects and reports as a representative of the Institute of Puerto Rican Culture and conducting investigations for this agency and private firms. Dr. Hayward is fluent in Spanish and has extensive experience preparing documents and conducting interviews in Spanish. In addition to her responsibilities as Senior Archaeologist with PCI, Dr. Hayward has co-written proposals to obtain funds from the National Park Service, administered by the Puerto Rican State Historic Preservation

Office (PRSHPO), to continue research on island rock art sites. This interest was initiated while she was employed at the Institute of Puerto Rican Culture.

Dr. Hayward has also served as Research Archaeologist and Project Review Archaeologist for the Center of Archaeological Investigations, Institute of Puerto Rican Culture, San Juan, Puerto Rico. Her duties included the initial assessment of some 600 to 800 annual permit applications for state and privately funded construction projects to determine the level of archaeological investigation; review of CRM reports for Phase I, II and III projects; review of proposals for Phase II and III investigations; preparation of detailed scopes of work for Phase II and III studies; meetings with applicants, both private and public, to discuss the level of project effort; and principal investigator on Institute-sponsored archaeological research projects.

PROFESSIONAL AFFILIATIONS

Register of Professional Archaeologists
Society for Historic Archaeology
Society for Latin American Anthropology
Society for American Archaeology
American Anthropological Association
International Association for Caribbean Archaeology

REPRESENTATIVE PANAMERICAN CONSULTANTS, INC. EXPERIENCE (1992 to Present)

Dr. Hayward served as Co-Principal Investigator and prepared the sensitivity assessment for a cultural resources baseline study of eight watershed areas for the Flushing Bay Ecosystem Restoration Project (FLUBERP), Queens County, New York.

Dr. Hayward served as co-principal investigator and primary author for the archaeological monitoring of overburden removal from the Commercial Slip, Buffalo, New York. This project involved several archaeologists from PCI working under contact fo Parsons, Brinckerhoff, Quade & Douglas, Inc. for the Empire State Development Corporation of New York. Previous archaeological investigations had uncovered remnants of the Commercial Slip, which beginning in the 1800s linked the Buffalo River with the Erie Canal. The slip was subsequently filled in by 1926. The next phase of the slip and surrounding waterfront development project necessitated the removal of the overburden and exposure of the slip wall elements for assessment. During the monitoring no significant cultural resources were impacted and the remaining slip walls and adjacent historic building foundations were found to be in good condition and recommended as eligible to the National Register.

She was principal investigator for a Phase I investigation of the grounds surrounding the former Married Junior Officers' Quarters (Building 124) at the U.S. Military Academy, West Point, Orange County, New York. The project was conducted for the USACE, New York District, under contract to Northern Ecological Associates, Inc. of Canton, New York. Building 124 was considered National Register eligible, but a suitable reuse for the structure could not be found. Its deteriorated condition made demolition the most viable alternative, with a HABS/HAER Level II documentation carried out before the building's removal. An intensive surface and subsurface examination of the adjoining 0.6-acre grounds was subsequently undertaken to locate any associated features or middens. A low concentration of historic and modern materials was recovered; no features were located; and a reworked terrain and vegetation profile were indicated.

Also for USACE, she was principal investigator for a Phase I investigation of the Hurricane Floyd Timber Sale Areas at the U.S. Military Academy, West Point, Orange County, New York. Under contract to Northern Ecological Associates, Inc. for the USACE, New York District, the project covered some 670 acres distributed among 18 non-contiguous heavily wooded regions. The aim was to employ background data from all the regions combined with a vehicular survey of each area along with more intensive inspection of five areas to develop levels of survey effort.

Also for the USACE, New York District, Dr. Hayward served as principal investigator for two cultural resource assessments of the area around Jamaica Bay off the Atlantic coast of New York.

She served as principal investigator on a Phase I study of the Morris Branch Canal Outlet area along the Passaic River waterfront, Newark, New Jersey. Conducted for the USACE, New York District, the investigation included documentary and background research, a review of earlier reports, archaeological excavation and report preparation. The goal was to locate any structural remains or features associated with the National Register-listed Morris Canal, which was operational by 1831.

Dr. Hayward served as Senior Archaeologist for a Phase I survey of the Green Brook sub-basin in Somerset and Union Counties, New Jersey. The investigation was undertaken for the USACE, New York District under contract to Barry A. Vittor and Associates, Inc., Mobile, Alabama. In addition to the archaeological work, PCI performed a National Register eligibility evaluation of Green Brook Park, an Olmsted Brothers designed facility. The project area included the park, as well as 18,560 linear feet along portions of the Stony Brook and Green Brook.

OTHER PANAMERICAN CONSULTANTS, INC. EXPERIENCE (1993 TO PRESENT)

Dr. Hayward has served as principal investigator/field director on more than twenty (20) cultural resource investigations in Puerto Rico and the U.S. Virgin Islands. The research comprised reviews of pertinent environmental and archaeological background information; field excavations; the development of research designs; and analyses of stratigraphic profiles, radiocarbon dates, artifacts, and faunal remains. For the Institute of Puerto Rican Culture Experience, Dr. Hayward and archaeologists Marisol J. Meléndez Maíz and Marlene Ramos Velez, conducted an investigation, documentation and comparative study of four rock art (petroglyph) sites in Puerto Rico.

Dr. Hayward served as Senior Researcher to prepare a Multiple Property Nomination with three individual rock art sites in Puerto Rico to the National Register of Historic Places (NRHP). The project involved field, library, and archival investigations with the goal of nominating to the National Register island rock art sites in general along with three individual locations. Dr. Hayward in collaboration with Dr. Michael A. Cinquino of Panamerican completed the investigations with monies obtained from the National Park Service's Historic Preservation Fund Grant, administered by the PRSHPO.

Dr. Hayward, along with Dr. Michael A. Cinquino of Panamerican Consultatns and Dr. C.N. Dubelaar of the Netherlands, authored a book on Puerto Rican rock art—*Puerto Rican Rock Art: a Resource Guide*. The funds for the book's publication were obtained from the National Park Service's Historic Preservation Fund Grant administered by the PRSHPO. The book provides a history of the project, an outline of Puerto Rican rock art characteristics, a listing of rock art sites on the island, and associated bibliographic references.

ARCHAEOLOGICAL LABORATORY EXPERIENCE

Dr. Hayward has served as Laboratory Director, taught laboratory methods at the graduate level, and has served as Laboratory Director and supervisor on PCI projects, including a mitigation project at El Morro (San Juan, Puerto Rico) and the Aklis prehistoric site at Sandy Point Wildlife Refuge (St. Croix, USVI). Her archaeological laboratory experience includes the identification and inventorying of prehistoric and historic material from a variety of culture areas and periods including the eastern United States, and the teaching of a graduate course in laboratory methods in Puerto Rico.

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ARNOLD PICKMAN
Industrial Archaeologist

EDUCATION

M.A. Archaeology, New York University, 1985
B.A. Anthropology, New York University, 1976

EXPERIENCE

Mr. Pickman is currently an independent consulting archaeologist. He has sixteen years experience in prehistoric and historic period archaeology and has conducted various field investigations throughout eastern New York and New Jersey. He is experienced at conducting cultural resource investigations on large-scale projects including landfill, utility, and highway projects, which often require design of field methodology including predictive site modeling strategies, all phases of archaeological field investigations, and report preparation.

Mr. Pickman has directed and implemented a comprehensive array of field methodologies pertinent to cultural resource investigations, including developing and implementing research designs, and directing field components for Phase I and Phase II field investigations. As principal investigator and field director he has coordinated and supervised Phase I and II field investigations.

CONSULTING PROJECTS CONDUCTED FOR U.S. ARMY CORPS OF ENGINEERS

Mr. Pickman served as co-principal investigator and industrial archaeologist for a cultural resources investigation for the Joseph G. Minish Passaic River Waterfront Park and Historic area located in the City of Newark, New Jersey. The investigation included documentary research, field measurements, and photographic recordation of cultural resources at sites of the former Newark Lime and Cement Company, the New Jersey Railroad & Transportation Company, and the Stephens and Condit Shipping Company.

He served as industrial archaeologist for the Morris Canal Right-of-Way cultural resource investigation in preparation for the construction of the Joseph G. Minish Passaic River Waterfront Park and Historic Area in Newark, New Jersey.

Mr. Pickman recently conducted a cultural resources assessment at the locations proposed T-groin installations at Rockaway Beach, Edgemere, Queens County, New York. The investigation included field inspection of 3000 feet of shoreline, documentary research, and photographic documentation of site and field conditions.

He also conducted Stage IB and Stage II archaeological investigations of prehistoric and nineteenth century industrial sites on the Ramapo River in Passaic County, New Jersey. He has prepared an annotated bibliography for Hudson River Environmental Reconstruction. Mr. Pickman conducted an archaeological survey and developed a predictive model for Greenwood Lake, Passaic County, New Jersey. He has conducted a cultural resource reconnaissance for the Beach Erosion Control Project, Rockaway Inlet to Norton's Point, Brooklyn, New York.

OTHER ARCHAEOLOGICAL CONSULTING PROJECTS

Mr. Pickman has conducted many New York-area cultural resources investigations. His responsibilities included documentary research, field reconnaissance, photographic documentation, and report writing. His projects include:

Cultural Resources Reconnaissance of the Atlantic Coast of Long Island, Jones Inlet to Rockaway Inlet, Long Beach Island, Nassau County, New York.
Archaeological Testing and Construction Monitoring, Shoreline Protection and other improvements, Alice Austen Park, Borough of Staten Island, City of New York, conducted for Lomma Construction and New York City Department of Parks and Recreation.

Archaeological Documentary Study and Field Testing, Sobel Court Park, Staten Island, New York. Conducted for New York City Department of Parks and Recreation.

Archaeological Documentary Study, South Jamaica Urban Renewal Area, Borough of Queens, New York. Conducted for New York City Department of Housing Preservation and Development.

Numerous Stage I and II archaeological investigations of prehistoric and historic sites in the counties of Suffolk, Westchester, Staten Island, Manhattan, Brooklyn, Queens, Nassau, Dutchess, and the Bronx.

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MARK A. STEINBACK
Senior Historian

EDUCATION

M.A. Local and Regional History, State University of New York at Albany, 1987
B.A. History (with Honors), State University of New York at Albany, 1985

EXPERIENCE

Mr. Steinback is currently Senior Historian for Panamerican Consultants, Inc. (PCI) and serves as director of report and proposal production for the Buffalo (New York) Branch office. He has more than ten (10) years experience conducting archival and historic period research and analysis. His experience includes preparing historic contexts, local ethnographic and historic period summaries, historic site sensitivity assessments for statewide and regional cultural resources and archaeological projects. These investigations include conducting archival, documentary, ethnohistoric, and cartographic research and preparing the historic period background and contexts of project sites; analyzing existing prehistoric and historic site and structure files, relevant federal and state census and deed research; and preparing written evaluations for inclusion in archaeological and cultural resource management reports and documents. Mr. Steinback exceeds the minimum professional qualification standards as delineated in 36 CFR Part 61 for History. He has a Masters degree in history and more than ten years of full-time experience in research, writing, teaching, and interpretation of historical data.

He is experienced at conducting historical and archival research for large-scale projects including U.S. military installations (e.g., the Air Force, Army, Marine Corps and Navy), pipeline/corridor projects, and flood-control projects, which often require detailed archival and historic map research, design of research questions as part of field methodologies, and report preparation (including Historic American Building Survey [HABS]/Historic American Engineering Record [HAER]-level documentation). In addition, he has more than ten (10) years editorial experience and has edited more than fifty (50) cultural resource, archaeological, structural, and environmental assessment reports for both public and private sector clients. He has been with PCI since November 1995.

Between 1991 and 1995 Mr. Steinback taught courses in American History and Western Civilization at Schenectady County Community College, Schenectady, New York, as an adjunct history instructor. He also has conducted research for state regulatory agencies, having worked for two years (1987-1989) at the New York State Department of Environmental Conservation (NYSDEC) in the Cultural Resources Section performing duties related to several major department projects. His early research interests focused on the development and practice of mercantilist theory as it concerned English colonization of North America and the Caribbean. His later research interests involved the industrialization of America from the 1840s through the 1920s with a special focus on socio-cultural history of workers and their responses to industrialization, immigration and urbanization. He is a member of the New York State Historical Association and the Organization of American Historians.

REPRESENTATIVE PANAMERICAN CONSULTANTS, INC. EXPERIENCE (1995 TO PRESENT)
For the New York Power Authority (NYPA) under contract to URS Corporation, Mr. Steinback was PCI's project historian for the cultural resources report for the NYPA recertification for the Niagara Power Project in the City of Niagara Falls, the towns of Porter, Lewiston and Niagara, Niagara County, and the Town of Grand Island, Erie County, New York. He conducted archival and documentary research, reviewed the NRHP and New York State archaeological and historic site information and prepared the historic context for the extensive project area along the Niagara River. He also edited the submission to URS.

Mr. Steinback served as Co-Principal Investigator and project historian for the Phase IA cultural resources investigation for the proposed Lake Shore Sewer District along Lake Road (State Road 18F) in the Town of Porter, Niagara County, New York. The Phase IA study was conducted for R&D Engineering along approximately 4,000 feet along both sides of Lake Road (State Road 18F) (8,000 ft in total were investigated) between Park Avenue and Two Mile Creek. The project area was east of Fort Niagara State Park, a NRHP-listed complex of structures north of the Village of Youngstown.

He was project historian for the Phase IA investigation for the proposed restoration of vehicular traffic on Main Street, City of Buffalo, New York. Prepared for Environmental Resources Management, the investigation was conducted in support of the preparation of an environment assessment (EA) for the proposed restoration of vehicular traffic to approximately 6,600 linear feet of Main Street in the City of Buffalo, Erie County, New York. The project area for the proposed restoration is Main Street between Tupper Street at the north end and Scott Street at the south.
For the U.S. Army Medical Research and Materiel Command, Mr. Steinback, as PCI's project historian, is preparing or has prepared the Cold War historic contexts for the architectural inventory and National Register evaluation of historic structures for Fort Monmouth (New Jersey), Pine Bluff Arsenal (Arkansas), Umatilla Chemical Depot (Oregon), and the Soldier System Center (Natick, Massachusetts). For each installation, he conducted a site visit and installation-specific archival and documentary research and prepared a summary of the installation's history and a Cold War (1946-1989) historic context based on the Army Materiel Command (AMC) Cold War context.

For the New York State Education Department's Cultural Resources Survey Program, Mr. Steinback served as PCI's project historian for four projects in western New York. These projects were a Phase I Archaeological and Architectural Reconnaissance Survey for PIN 5111.76.121, NYS Route 20 Bridge over Little Canadaway Creek (BIN 1015390) Lamberton, Town of Pomfret, Chautauqua County, New York; Cultural Resources Site Examination Shoe-Last Factory Site (NYSM #11075) PIN 5576.71.121, Town of Ischua, Cattaraugus County, New York; Phase I Archaeological and Architectural Reconnaissance Survey for PIN 5576.71.121, NYS Route 16 Bridge Replacements (BIN 10111700 and BIN 1095540) and Stream Work at BIN 1095540, Ischua, Cattaraugus County, New York; Cultural Resource Reconnaissance Survey Report for Pin 4089.01.101 NYS Route 89 Bridge (Bin 1034330) Replacement, Town of Savannah, Wayne County, New York.

For the New York District, U.S. Army Corps of Engineers, Mr. Steinback has conducted background, archival, cartographic, and documentary research and prepared the historic period background for fourteen (14) projects at the U.S. Military Academy at West Point, New York. These projects included twelve (12) Phase I cultural resources investigations (for the Stony Lonesome Child Development Center, the Stony Lonesome One-Stop Shopping Center [PX], the Cat Hollow Swamp/Beaver Pond timber harvest, the Long Pond/Stillwell Lake timber harvest, the Firebreak 2 timber harvest, the Turkey Mountain timber harvest, the Stony Lonesome By-Pass, the Hurricane Floyd timber harvest, the former Married Junior Officer's Quarters, the proposed Gross Olympic Center, and the proposed Range Road 22 and Mine Lake timber harvests); one

Phase II investigation (for the Stony Lonesome PX); and one Phase III data recovery project (Revolutionary War Hut Site #6). These projects are being or were conducted for construction of a child development center, a new PX, an olympic swimming center, a road relocation, and proposed timber harvests. Both prehistoric and historic period sites have been identified during the field investigations.

Since 1996 Mr. Steinback has served as project historian for more than seventy-five (75) local (Western New York) projects for which he has conducted and/or prepared historical, background and environmental research and/or edited the report. These projects include, but are not limited to, a Phase IA for the proposed Cayuga Road Sports Complex, Cheektowaga, Erie County, for TVGA Engineering, Surveying, P.C.;a Phase IA for the proposed Ellicott Creek Trailway Extension, Audubon Recreation Area, Amherst, for URS Greiner Woodward Clyde; a Phase I for the proposed waterline construction for the Town of Newstead Water District #5, Erie County, for Wendel Design; and two Phase IA for the Chautauqua County Department of Public Facilities (the proposed Chadakoin Riverfront Park and Waterway Trail, Town of Ellicott and the proposed property acquisition adjacent to the Chautauqua County Airport, Town of Ellicott); a Phase IA, Phase IB, and Phase II for the proposed West Seneca Rotary Foundation, Orchard Park Golf Course, Orchard Park, Erie County, for TVGA; a Phase I and Phase II for the proposed housing facility at 575 Cayuga Creek Road, Cheektowaga, for Peregrine Companies; a Phase I for the proposed Genesee Valley Central School, Belmont, Town of Amity, Allegeny County, for Nussbaumer & Clarke, Inc.; several Phase I's for the Model City clay mine and landfill expansion, Lewiston, Niagara County, for Benchmark Environmental Engineering & Science, PLLC; and a Phase I and II for the Town of Lockport proposed sewer project, Niagara County, New York, for Wendel Design.