SEARSPORT HARBOR
SEARSPORT, MAINE
NAVIGATION IMPROVEMENT PROJECT

TECHNICAL REPORT 2

MARINE ARCHAEOLOGICAL SURVEY

July 2007

TECHNICAL REPORT

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SEARSPORT HARBOR
Searsport, Maine

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13. ABSTRACT *(Maximum 200 words)*

PAL, under contract with the U.S. Army Corps of Engineers, New England District, conducted a remote sensing archaeological survey of the proposed navigation improvement project area in Searsport Harbor, Maine. The archaeological work was conducted to identify and document remote sensing target areas with potential to be significant archaeological deposits (i.e., shipwecks) or intact paleosols with archaeological sensitivity for containing pre-contact sites within the project area. The survey consisted of archival research and field investigation using differential GPS, side scan sonar, a marine magnetometer, and sub-bottom profiler to acquire 100 percent coverage within the project area along a series of parallel surveyed track lines spaced 50 feet apart.

Systematic, multidisciplinary archival and remote sensing archaeological field survey of the Searsport navigation improvement project area documented the wreck of the historic schooner-barge *Cullen No. 18*, as well as a buried relict fluvial geomorphic feature with archaeological sensitivity for potentially containing pre-contact period archaeological deposits. Based on the results of this study, additional archaeological investigations within the project area are recommended: 1) vibratory coring to determine presence/absence of archaeologically sensitive paleosols; and 2) visual inspection of the *Cullen No. 18* shipwreck target to preliminarily assess the site's National Register eligibility.

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MANAGEMENT ABSTRACT

PAL has completed a remote sensing archaeological survey of the proposed navigation improvement project area in Searsport Harbor, Maine. The archaeological work was conducted to identify and document any remote sensing target areas with potential to be significant archaeological deposits (i.e., shipwecks) or intact paleosols with archaeological sensitivity for containing pre-contact sites within the project area. The survey was authorized and conducted under contract with the U.S. Army Corps of Engineers, New England District to comply with Section 106 of the National Historic Preservation Act of 1966 (16 USC 470f), as amended (1976, 1980, 1992, 1999), and implementing regulations of the Advisory Council on Historic Preservation (36 CFR 800).

The remote sensing survey consisted of archival research and field investigation using differential GPS, high frequency side-scan sonar, a cesium-vapor marine magnetometer, and a seismic sub-bottom profiler to acquire 100 percent coverage within the proposed navigation improvement area along a series of parallel surveyed track lines spaced 50 feet apart.

Systematic, multidisciplinary archival and remote sensing archaeological field survey of the Searsport navigation improvement project area documented the wreck of the historic schooner-barge *Cullen No. 18*, as well as a buried relict fluvial geomorphic feature with archaeological sensitivity for potentially containing pre-contact period archaeological deposits.

Based on the results of this study, additional archaeological investigations within the Searsport navigation improvement project area are recommended: 1) a limited program of vibratory coring to determine the presence/absence of archaeologically sensitive paleosols; and 2) visual inspection of the *Cullen No. 18* shipwreck target to preliminarily assess the site's National Register eligibility.

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CHAPTER ONE

INTRODUCTION

This report presents the results of a remote sensing marine archaeological survey of the U.S. Army Corps of Engineers, New England District's (NAE) proposed navigation improvement project area in Searsport Harbor, Maine (Figures 1-1 and 1-2). The NAE is preparing to undertake the channel deepening project to provide improved access to piers located on the southeast corner of Mack Point at the mouth of Long Cove. The archaeological work was conducted to identify and document any remote sensing target areas with potential to be contact or post-contact period archaeological deposits (i.e., shipwrecks) or intact paleosols with archaeological sensitivity for containing pre-contact archaeological deposits. The survey was conducted under contract with the NAE, in accordance with approved work and safety plans for the investigation.

Scope

As a federal undertaking, the NAE dredging project is subject to review under Section 106 of the National Historic Preservation Act (NHPA) of 1966 as amended (36 CFR 800). Section 106 requires that all federal agencies take into account the effect of their undertaking on cultural resources listed or eligible for listing in the National Register of Historic Places (National Register) (36 CFR 60). The agency must also afford the Advisory Council on Historic Preservation the opportunity to comment on the undertaking. The Section 106 process is coordinated at the state level by the State Historic Preservation Office (SHPO), which in Maine operates within the office of the Maine Historic Preservation Commission (MHPC).

The scope of the archaeological investigations (Appendix A) included archival research and fieldwork consisting of a marine geophysical survey utilizing a magnetometer, side-scan sonar, and a sub-bottom profiler. The fieldwork and report will assist NAE in complying with Section 106 of the NHPA of 1966, as amended (1976, 1980, 1992, 1999), for the proposed channel deepening project. The report will also be a scholarly document that fulfills the mandated legal requirements, and serves as a scientific reference and planning tool for future professional studies.

Authority

The survey was authorized by NAE to comply with the National Historic Preservation Act of 1966 (P.L. 89-665; 80 Stat. 915) as amended (16 U.S.C. 470 et seq.); the National Environmental Policy Act of 1969 (P.L. 91-190; 83 Stat. 852; 42 U.S.C. 4321 et seq.); the Archaeological Resources Protection Act of 1979 (P.L. 96-95; 93 Stat. 721; 16 U.S.C. 470 et seq.); the Abandoned Shipwreck Act of 1987 (P.L. 100-298; 102 Stat. 432; 43 U.S.C. 2102); the National Maritime Heritage Act of 1994 (P.L. 103-451; 108 Stat. 4769; 16 U.S.C. 5401); the Advisory Council on Historic Preservation, Protection of Historic Properties (36 CFR 800); the National

Figure 1-1. 1972 (rev. 1990) USGS Maine State Map (1:2,500,000 scale) showing the general location of the Searsport Harbor project area location in Waldo County.

Marine Archaeological Survey, Searsport Harbor, May 2007

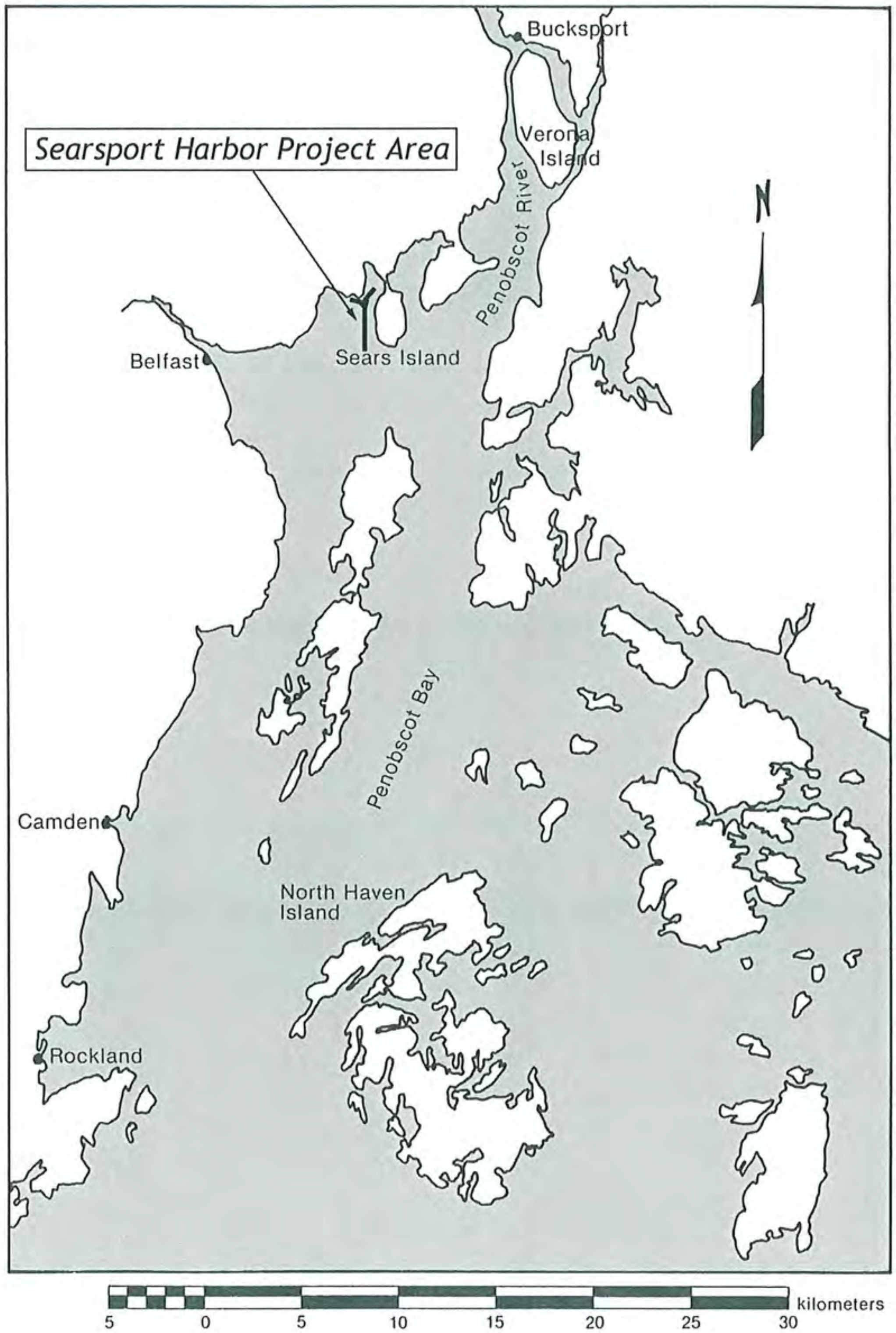

Figure 1-2. Searsport Harbor project area within Penobscot Bay (after Spiess and Hedden 1983:6).

Marine Archaeological Survey, Searsport Harbor, May 2007

Register of Historic Places, Nominations by States and Federal Agencies (36 CFR Part 60); the U.S. Army Corps of Engineers' Regulations ER 1105-2-50, Planning, Environmental Resources, Chapter 3, Historic Preservation; the Secretary of the Interior's *Standards and Guidelines for Identification* (1983); the Maine Historic Preservation Commission's Contract Archaeology Guidelines; and the Maine Department of Educational and Cultural Services State Historic Preservation Officer's Standards for Archaeological Work in Maine (27 MRSA S.509).

The remote sensing archaeological survey statement of work was approved by the NAE district archaeologist, and performed in consultation with the state archaeologist at the MHPC. No state permit was required to conduct the non-disturbance remote sensing survey.

All fieldwork was conducted in accordance with the Accident Prevention Plan (APP) and the Activity Hazards Analyses (AHAs) prepared by PAL, and their marine survey subcontractor, Ocean Surveys, Inc. (OSI), for the project. Both the APP and AHAs were approved in writing by the NAE Safety Office prior to commencement of field activities.

Project Description

The closest US port to Europe and the first port in the Northeastern US Corridor, the deep water port of Searsport is used by domestic and international commercial vessels throughout the year (Searsport Port Committee n/d:3–5). The harbor's 500-foot- (ft) (152-meter [m]) wide federal navigation channel and 1,500-ft (457 m) turning basin are maintained at an authorized depth of 35 ft (11 m) below Mean Low Low Water (MLLW) (Barbara Blumeris, personal communication 2006; Searsport Port Committee n/d:5). This depth prevents use of the harbor by deeper drafted commercial vessels; therefore, the USACE is currently considering the feasibility of removing sediments from the harbor floor to establish a new controlling channel depth of between 40 and 42 ft (12 and 13 m) below MLLW within the study area depicted in Figure 1-3 (Barbara Blumeris, personal communication 2006).

Nature of Study

This marine archaeological study was conducted as part of a larger investigation designed to assess the proposed project's effects on submerged archaeological deposits as well as to evaluate geologic conditions in the depth of interest for the project. To record the data necessary for this assessment and evaluation, PAL and its sub-consultant, Ocean Surveys, Inc. (OSI), performed a vessel-based non-disturbance survey using a towed array of remote sensing instruments to document geological and potential cultural features on the seafloor, in accordance with the field methodology approved in advance by NAE. Archival research of primary and secondary sources and informal informant interviews were performed as part of the archaeological task as well, in order to obtain the necessary information for preparing environmental and historical context narratives of the survey area, and make preliminary determinations of National Register eligibility for identified resources.

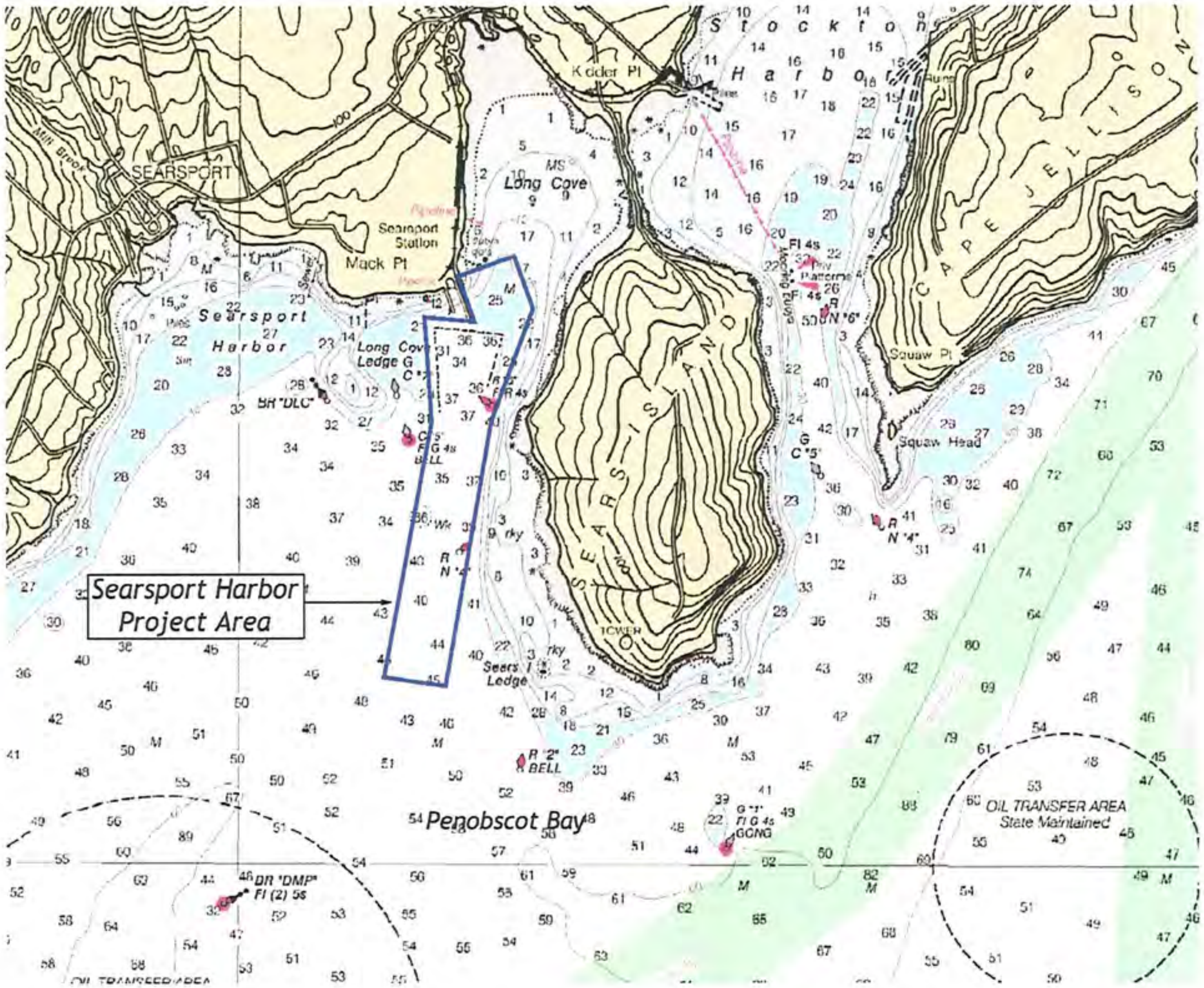

Figure 1-3. Excerpt of NOAA Chart No. 13309 showing the limits of the project study area within Searsport Harbor (map courtesy of OSI).

Project Personnel

PAL staff involved in the project included Deborah C. Cox (project manager), David S. Robinson (senior marine archaeologist/principal investigator/site safety and health officer), and Suzanne Cherau (corporate safety and health officer). OSI project staff included Thaddeus A. Nowak (general manager), John D. Sullivan (geophysical surveys program manager), Jeffrey D. Gardner (senior geophysical scientist/project manager), and Greg Schulmeister (marine electronics technician/boat operator).

Disposition of Project Materials

All project information is currently on file at PAL, 210 Lonsdale Avenue, Pawtucket, Rhode Island. PAL serves as a temporary curation facility for these materials until such time as the U.S. government designates a permanent repository that meets the requirements under 36 CFR 79.

CHAPTER TWO

METHODOLOGY

The systematic, interdisciplinary research methodologies employed in this investigation followed those outlined in the NAE project scope-of-work (SOW) (see Appendix A) and did not deviate from the project Work Plan. The two principal goals of this investigation were:

1) assess the archaeological sensitivity of the Searsport Harbor project area and;

2) determine the presence or absence of archaeological properties within it.

These goals were met through a combination of archival research and remote sensing archaeological field survey. Archaeological sensitivity is defined as the likelihood for archaeological sites to be present within a particular area based on different categories of information. In the case of the Searsport Harbor project area, such sites could potentially include submerged pre-contact period Native American settlement sites, fishing gear, and watercraft, as well as contact and post-contact period Native and Euro-American fishing gear and watercraft.

Assessment of the Searsport Harbor project area's archaeological sensitivity involved conducting archival research to identify and consider previously documented offshore archaeological resources, the environmental and geomorphological history and sedimentary environment of Searsport Harbor within the context of Penobscot Bay, and regional/local pre-contact through post-contact period settlement, subsistence, and maritime activity patterns. For this aspect of the investigation, a review of the following sources was completed:

- National and State Registers for any archaeological properties in the proposed Searsport Harbor project area that have been listed on or are potentially eligible for nomination to be listed;

- National Oceanic and Atmospheric Administration's (NOAA) on-line Automated Wreck and Obstruction Information System (AWOIS);

- Northern Maritime Research's Northern Shipwreck Database (NSWDB) (Version 2002);

- Paul Sherman's Collection of Shipwreck Notes and Information on file at the Massachusetts Board of Underwater Archaeology;

- Environmental studies providing information about the geomorphological history of coastal Maine and the effects of the Holocene marine transgression;

- Published and unpublished primary and secondary sources held in the Special Collections section of the Belfast Public Library, the Maine State Library, and in the research library at PAL; and

- Informal informant interviews with: Maine State Archaeologist, Arthur Spiess; Penobscot Marine Museum ExecutiveDirector, Niles Parker; Penobscot Marine Museum Curator, Ben Fuller; University of Maine Darling Marine Center Research Associate Professor, Warren Riess; Dean of the Maine Maritime Academy Corning School of Ocean Sciences, John Barlow; Propeller Club-Bucksport and Searsport members William Abbot and Jon Johansen; Belfast Free Library Special Collections Librarian, Betsy Paradis; and Massachusetts Board of Underwater Archaeological Resources Deputy Director, David Trubey.

In addition to the archival research that was performed, a marine archaeological reconnaissance field survey was completed between December 14 and 20, 2006. The field investigation methodology followed the specifications outlined in the NAE's project SOW and consisted of non-disturbance marine remote sensing survey performed by PAL and its subcontractor (OSI) to aid in determining the presence/absence of potential archaeological properties within the Searsport Harbor project area.

Survey operations were conducted from OSI's research vessel (R/V *Ready II*), a 26-ft (8 m) motorboat equipped with dual outboard engines, a fully enclosed cabin, and an array of survey and support equipment (Figure 2-1). A differential satellite global positioning system (DGPS) interfaced with an onboard computer was used to precisely navigate the vessel throughout the survey area and record positioning data. Differential satellite corrections transmitted to the survey vessel via a radio link at a frequency and rate of 316 kilohertz (kHz)/100 bits per second (bps) from the U.S. Coast Guard DGPS beacon at Brunswick, Maine provided reliable survey control of the vessel throughout the survey area. The computer navigation software utilized onboard the survey vessel converted the geodetic coordinates (latitude-longitude) to State Plane coordinates (easting-northing) for navigation while logging these position data at one-second intervals along survey track lines. The survey was conducted in the Maine State Plane Coordinate System - East Zone 1801, referencing the North American Datum of 1983 (NAD 83) with all coordinates in feet. The accuracy of the positioning system was verified by performance of navigation checks at the start and end of each survey day at a horizontal check point (i.e., "Town Dock 2006") established at the town pier in Searsport. The recorded position of this check point was N 286680 / E 873332 (Maine State Plane Coordinate System - East Zone 1801, referencing the NAD 83). According to Trimble, this DGPS configuration typically provides repeatable position accuracies of less than 3 ft (1 m).

Prior to beginning field investigations, coordinates were obtained from the NAE for the boundaries of the Searsport Harbor project area (Table 2-1). These coordinates were as follows:

Figure 2-1. Searsport Harbor Project survey vessel R/V *Ready II*.

Table 2-1. Searsport Harbor Survey Area Limits

Point	Easting (feet)	Northing (feet)
1	881678	287375
2	882106	286177
3	881159	283650
4	880108	277663
5	878712	277860
6	879806	283611
7	879651	285896
8	880773	285896
9	880407	286921

Survey equipment used to complete the field investigation included:

- Trimble 4000 and ProBeacon Differential GPS;
- HYPACK MAX Navigation Software;
- Klein 3000 Dual Frequency Side Scan Sonar System (Figure 2-2);
- Geometrics G-882 Marine Cesium Magnetometer (see Figure 2-2);
- Applied Acoustics Engineering "Boomer" Seismic Reflection System (see Figure 2-2).

The side-scan sonar towfish and magnetometer sensor were deployed off the sides of the vessel and each towed off a davit and winch to allow modification of sensor height along tracklines. The side-scan sonar system was set at a 164 ft (50 meter) sweep range to obtain high resolution data with more than 200 percent overlapping coverage of the bottom. Side-scan sonar data were collected on parallel lines spaced 150 ft (46 m) apart. The altitude of the side-scan sonar towfish above the bayfloor was maintained at 10 to 15 percent of the range where water depth allowed.

To ensure detection of even the smallest targets of potential archaeological interest, the magnetometer sensor was towed at an altitude of not more than 20 ft (6 m) above the bay's floor and measurements of the Earth's magnetic field were recorded along every one of the survey track lines, which were offset at a 50 ft (15.25 m) interval (Figure 2-3).

The "boomer" sound source (catamaran with boomer plate) and receiver (hydrophone array or "eel") were towed off the vessel's stern outside the boat propeller wash to minimize acoustic noise. Sub-bottom profile data were recorded along every third track line, at the same 150 ft (46 m) interval as the side-scan sonar. The "boomer" seismic system recorded data at a 100 millisecond scan rate to record a total depth profile (water and stratigraphic column) of approximately 250 ft (76 m) (assuming 5,000 ft (1,524 m) per second sound velocity in sediments). The system collects raw seismic signals in the 0 to 10 kHz range, with filtered frequencies of 0.08 to 4 kHz used for final display and interpretation. Laybacks and offsets to sensors were recorded in the field for application during post-survey processing.

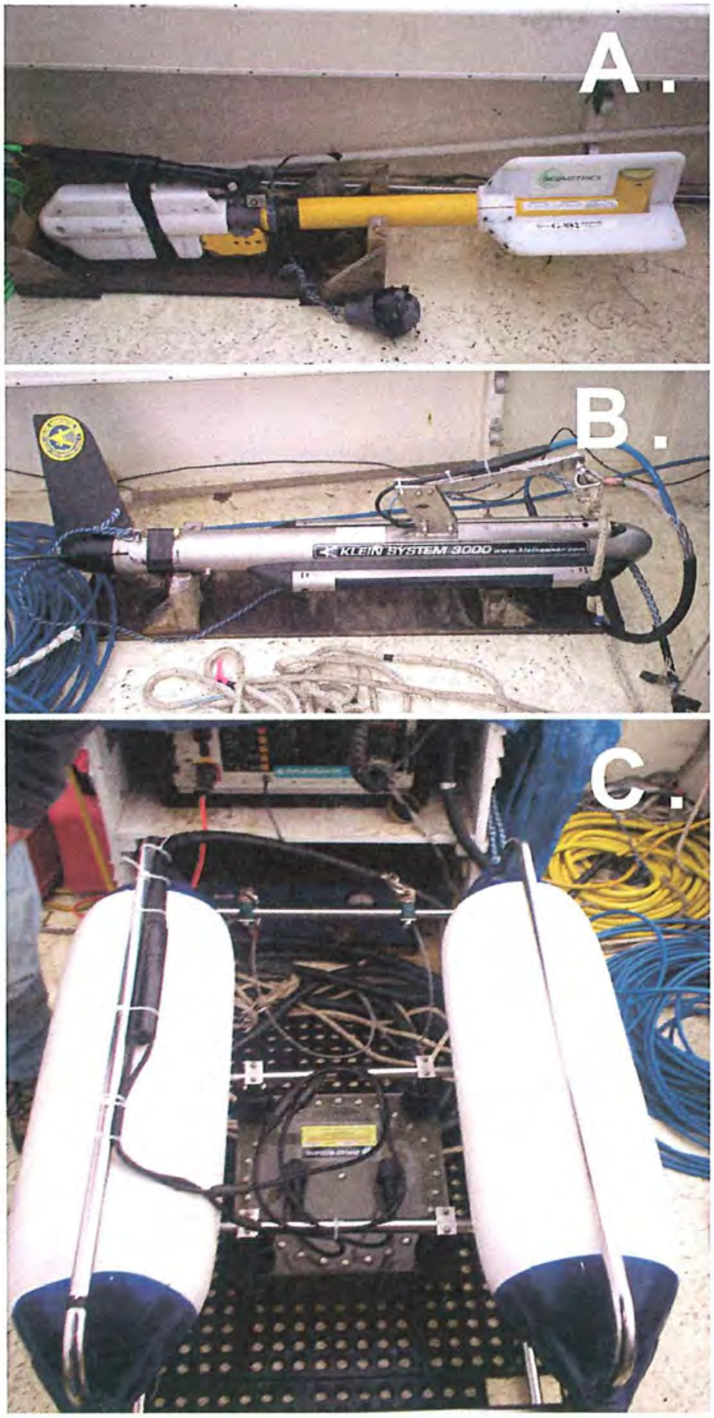

Figure 2-2. Searsport Harbor Project survey instrumentation: A) Geometrics 882 cesium-vapor marine magnetometer sensor; B) Klein 3000 dual frequency digital side scan sonar towfish; and C) Applied Acoustics Engineering seismic reflection system (power supply and catamaran with boomer plate – hydrophone array not shown).

Marine Archaeological Survey, Searsport Harbor, May 2007

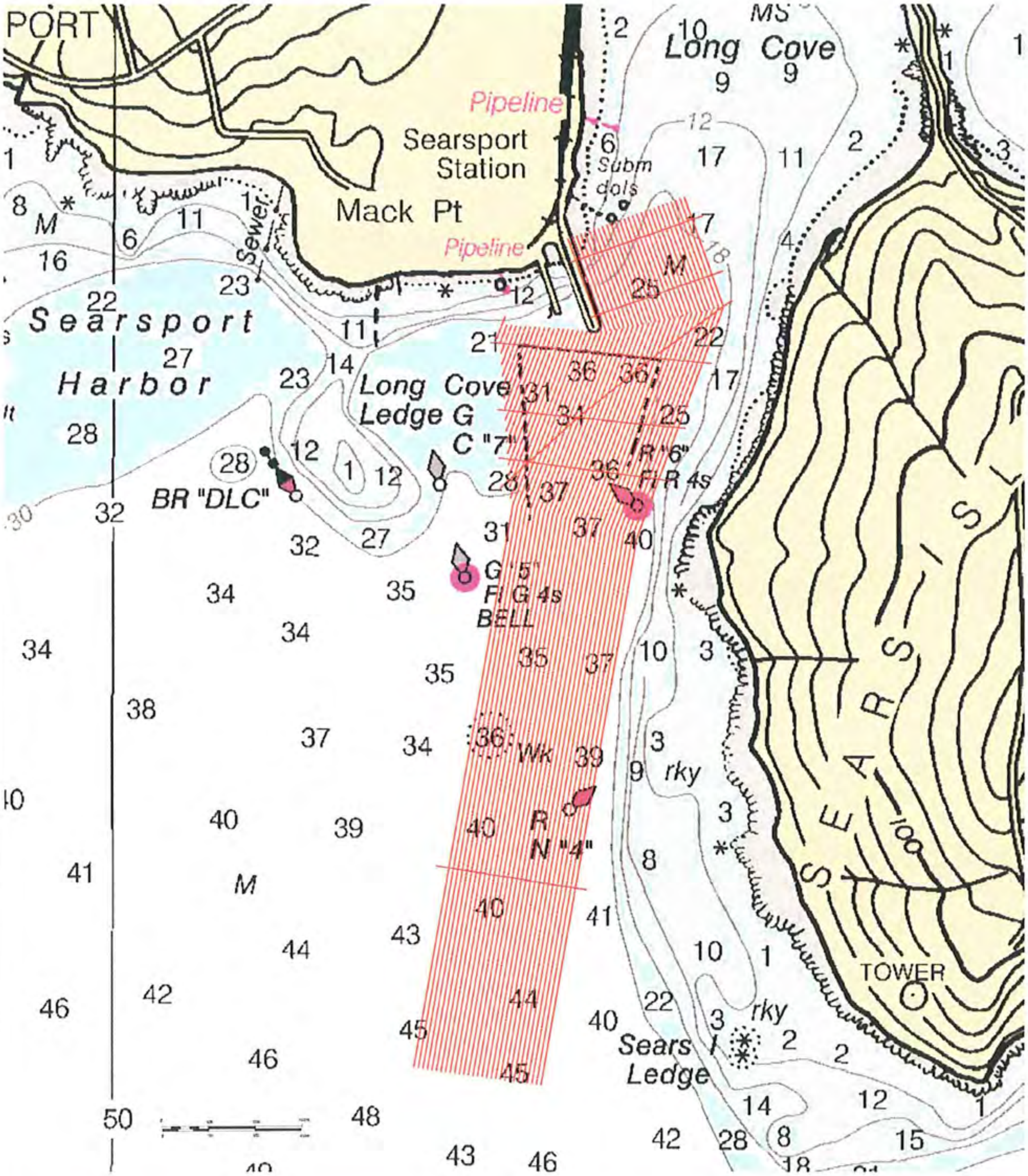

Figure 2-3. Searsport Harbor project planned survey track lines and tie-lines (magnetometer line interval - 50 ft [15.25 m]; side scan sonar and sub-bottom profiler line interval – 150 ft [46 m]) (plot courtesy of OSI).

Lines were numbered and identified to allow ease of use. As an additional means of providing data quality control, 7 "tie lines" (i.e., track lines running perpendicular to the primary track lines) were also surveyed. Data generated by the survey were reviewed by the project's qualified, experienced marine archaeologist, both as they were recorded in the field and after post-processing. Post-processing of the data involved reconstructing survey track lines to include adjustments for sensor layback and offset, and plotting the x/y coordinates logged at each "fix" point along each track by the HYPACK MAX software package.

Criteria utilized for interpreting the various types of survey data (both during and after the survey) and selecting anomalies as targets of potential archaeological interest, either individually or collectively with other anomalies, relied on a combination of factors. These factors included the type of data being considered, environmental conditions, predicted types of resources likely to be encountered, survey-design parameters employed, and the scientific knowledge and practical experience of the project archaeologist.

Consideration and interpretation of acoustic data produced by the side-scan sonar and sub-bottom profiler is relatively straightforward. Acoustic targets appear as visual anomalies in the ambient visual field of the sea floor in either plan view (as in the case of a side-scan sonar record) or in profile (as in the cases of sub-bottom profiler and fathometer records). Side-scan sonar targets are selected as possible archaeological targets based on their appearances, that is, whether or not they appear to be a shipwreck or cannot otherwise be eliminated as a possible shipwreck. The sizes of targets, their relief above the sea floor, and the relative density of their constituent parts are all obtainable from the sonar record.

Sub-bottom profiler targets generally fall into two categories of archaeological interest: those that appear to be shallowly buried, discrete, anthropogenic deposits, and those that appear to be buried geological features. The former can be associated with shipwrecks, and if so, often have corresponding anomalies within the magnetometer data and side-scan sonar data (e.g., low to moderate intensity and moderate duration magnetic signatures and subtle, yet distinct, changes in bottom composition). The latter are sometimes associated with anomalies in the magnetic data and/or changes in sea floor that are visible in the acoustic data sets. Sub-bottom reflectors that are geological in nature and buried beneath the surface of the sea floor result from changes in sediment density caused by post-inundation marine sedimentation processes, inundation sequences, pre-submergence depositional events, or older geological processes. Some reflectors have characteristics that are readily identifiable as relict elements of the pre-submergence paleolandscape, such as paleochannel features, beach/shoreline features, upland terraces, etc. However, conclusive determination of the nature of a reflector requires physical evidence obtained through geotechnical surveying (i.e., vibratory cores or deep borings).

Interpretation of magnetic data is less straightforward. Anomalies of archaeological interest can range from several to thousands of gammas in intensity, and extend tens or hundreds of feet or meters in duration, depending on the characteristics of the source and its distance from the point of measurement (i.e., the magnetometer sensor). Even though a considerable body of magnetic signature data for shipwrecks is now available, it is impossible to positively associate any specific magnetic signature with a particular type or age of shipwreck or any other feature (Pearson and Saltus, Jr. 1991:49). Variations in iron content, condition, and distribution of a ship's wrecked remains, as well as the survey's design parameters (particularly track line interval and sensor tow depth) combine to influence the intensity and configuration of the anomaly produced.

Marine remote sensing archaeological surveys conducted at a tight survey track line interval (e.g., 50 ft [15.25 m] or less, as in the case of this survey) provide magnetic data that is comprehensive in its coverage and of adequate resolution to differentiate patterns in the data that are indicative of potential shipwrecks, geological deposits, or isolated modern debris. Since shipwreck sites commonly consist of a centrally concentrated area of large (possibly buried) debris associated with primary hull remains trailed or surrounded by a more diffuse distribution of relatively smaller debris (e.g., displaced secondary hull components, cargo, armament, etc.), such deposits are generally detectable as "complex" anomalies (i.e., a cluster of magnetic anomalies with signatures consisting of dipolar and/or monopolar anomalies) occurring on multiple adjacent survey track lines. Magnetic targets associated with shipwrecks are also often accompanied by correlating side-scan sonar and/or sub-bottom profiler anomalies, although there are circumstances when such correlating anomalies are absent or difficult to detect. By comparison, magnetic anomalies associated with geological deposits are often distributed in regular patterns extending over broad areas of the sea floor, while those associated with modern isolated debris can exhibit high intensity magnetic signatures, but typically are detected for only brief durations and/or on just a single track line.

By contrast, in instances when a survey is conducted at track line interval wider than 50 ft (15.25 m) and the magnetometer sensor is more likely to be farther away from a magnetized source, anomalies associated with shipwrecks are typically lower in intensity, less complex in signature, and may be detectable on just a single line or missed altogether between lines. The reasons for these differences, the magnetometer's limited range of detection, and its implications for archaeological surveys are discussed fully by Aneskiewicz (1986), Bell and Nowak (1993), and Breiner (1973).

In all cases, interpretation and the target selection process are significantly enhanced by the ability to cross-correlate data collected simultaneously from multiple instruments with different detection capabilities and data gathered from adjacent track lines. Rather than select potential cultural targets from a single data set or individual track lines, all of the data are examined simultaneously as they are recorded in the field and after post-processing for the presence of any correlations between data sets and across multiple track lines that provide clues regarding the possible identity of a particular target. Additionally, data associated with modern and/or spurious sources can be recorded as such in the field and eliminated from further consideration as a target of potential archaeological interest.

The remote sensing data recorded during this survey were used in conjunction with the results from the study's archival research component to determine the presence/absence of targets potentially representing archaeological deposits (e.g., shipwrecks) or archaeologically sensitive areas (i.e., contextually intact elements of the inundated paleolandscape or "paleosols") within the Searsport Harbor study area. The data were also used to formulate preliminary statements of resource significance and project impacts that should be avoided regarding these deposits, and provide recommendations regarding further archaeological investigation of these deposits.

CHAPTER THREE

ENVIRONMENTAL CONTEXT

Environmental settings, conditions, and natural resources are important factors to consider when assessing the potential for the presence of archaeological deposits, including early pre-contact settlements submerged by eustatic sea level rise. As Renfrew (1976) notes, "because archaeology recovers almost all of its basic data by excavation, every archaeological problem starts as a problem in geoarchaeology." The complexity and variability of geological processes make every region or site geologically unique, and sediments comprising the upper reaches of the sea floor in Penobscot Bay and Searsport Harbor are no exception. Understanding the evolving and dynamic geomorphic landscape of the upper bay and harbor, which were once exposed land available for human habitation, is essential for assessing the potential archaeological sensitivity of the Searsport Harbor project area.

As described in Chapter 2, the Searsport Harbor project area covers the entrance channel and turning basin immediately west of Sears Island in Searsport Harbor, and extends northward a short distance into Long Cove, adjacent to and east of the Maine Port Authority pier on Mack Point (exclusive of the nearshore area between the Sprague Energy Terminal and Port Authority piers) (see Figure 1-3). Charted water depths in the study area ranged from 0 ft (0 m) in Long Cove at the northeast corner of the Port Authority pier to approximately 45 ft (14 m) at the southeastern corner of the study area in the entrance channel, west of Sears Island Ledge.

Searsport Harbor lies at the head of Penobscot Bay, one of the largest and most geomorphologically complex embayments on the inner shelf of the western Gulf of Maine (Kelley and Belknap 1989:3). Approximately one-quarter mile (400 m) northeast of Sears Island, the Bay narrows and becomes the mouth of the Penobscot River. The 350-mile (563-kilometer [km]) long river and its 8,610-square mile (22,300-square km) drainage system are the longest and largest in Maine (Penobscot River Study Team 1972:15) and provide protected access to a rich mixed terrestrial and marine environment (Spiess and Hedden 1983:5) (Figure 3-1). The Penobscot watershed is bounded by the St. Croix watershed to the east and Moosehead Lake and the Kennebec watershed to the west.

Complex tectonic folding and faulting of the underlying local bedrock, as well as the glacio-geological forces of the late Pleistocene and early Holocene epochs associated with the advance and retreat of the Laurentide Ice Sheet (LIS) and concomitant fluctuations in sea levels, have together shaped the basic geometry of the Penobscot Bay/Searsport Harbor area. Marine geologists working in Maine have divided the Bay into four distinct regions (Figure 3-2), based on physiographic differences in the seafloor's bathymetry:

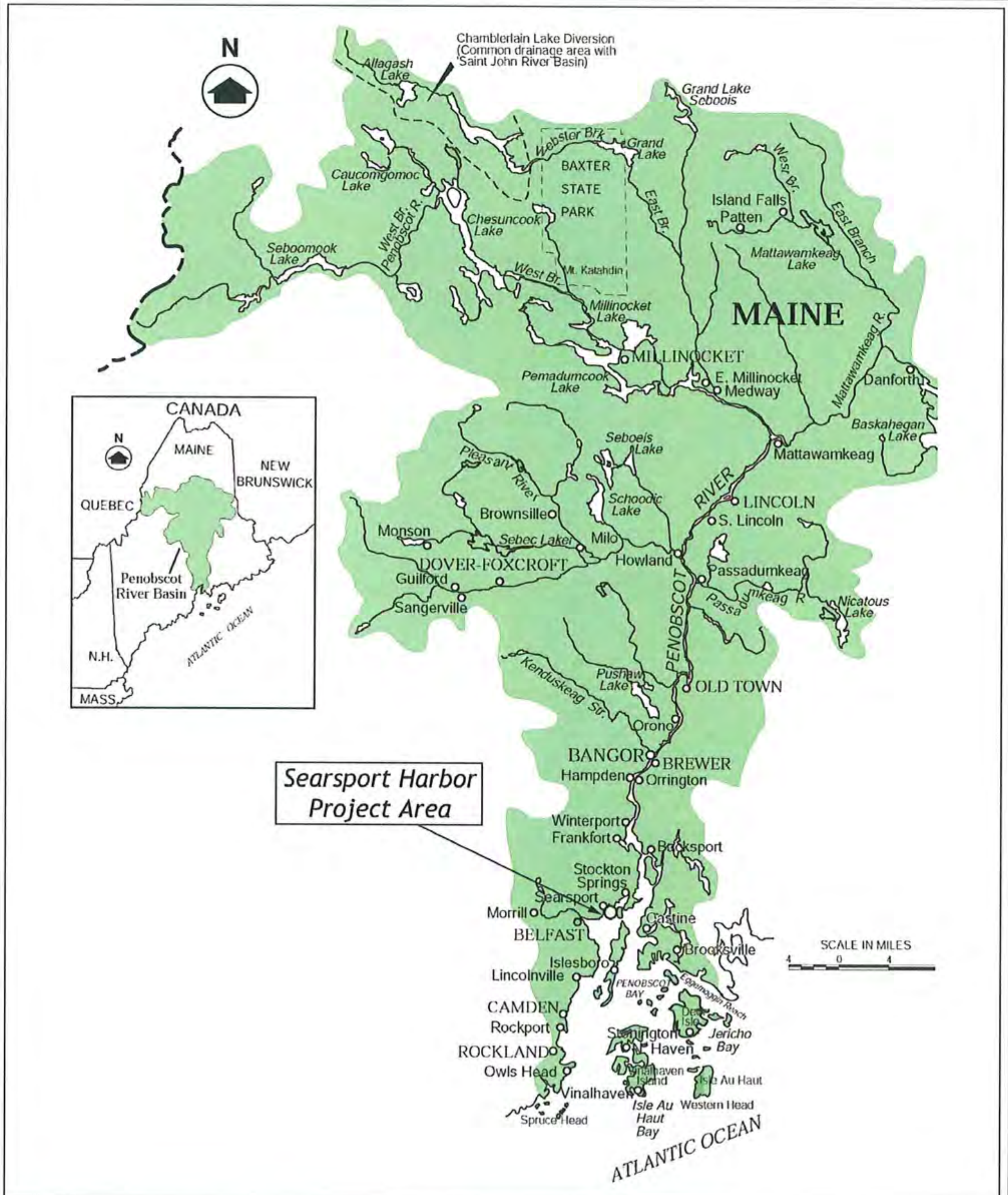

Figure 3-1. Penobscot River drainage showing project area (source: U.S. Army Corps of Engineers New England District n/d).

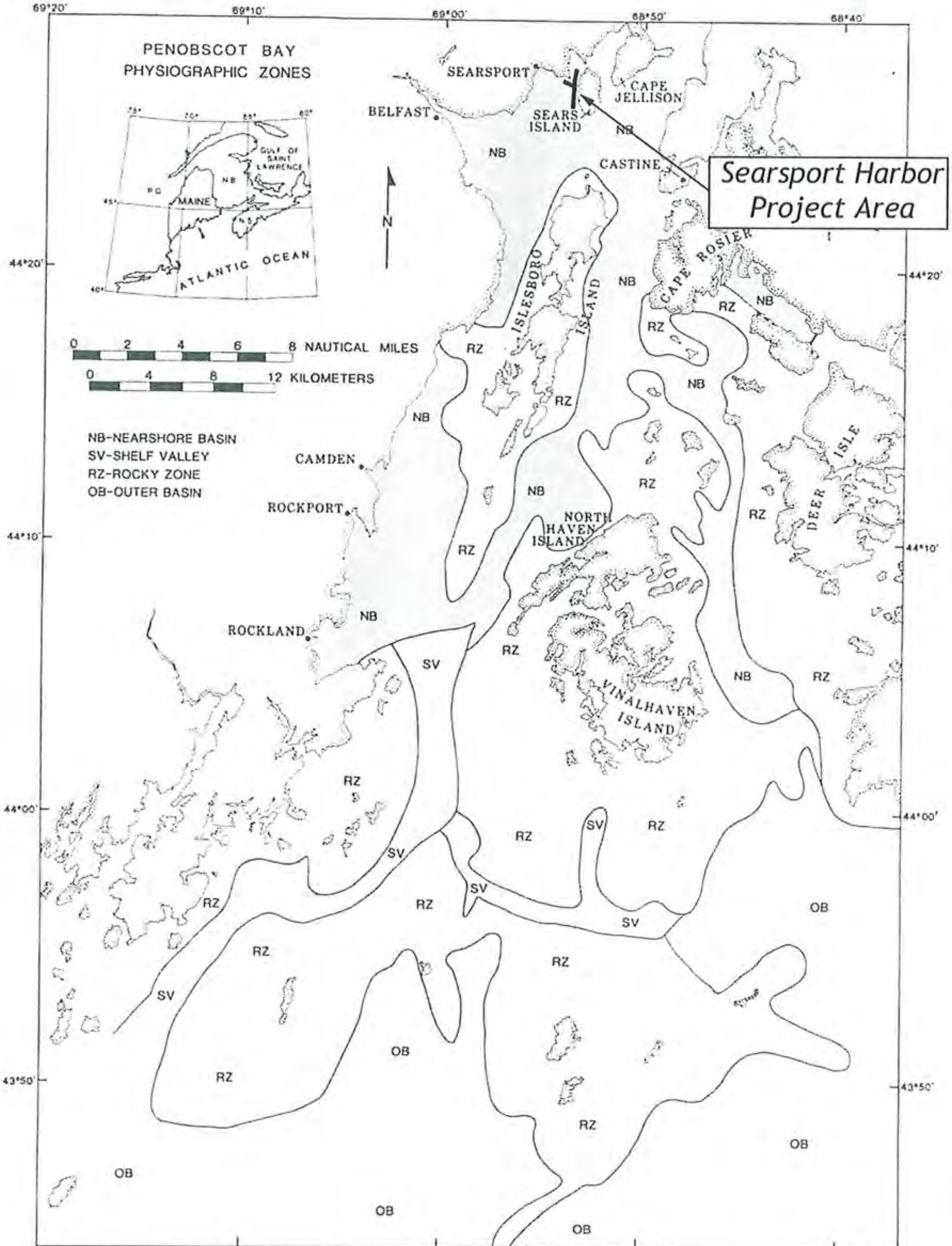

Figure 3-2. Physiographic regions of Penobscot Bay: 1) Nearshore Basins (NB); 2) Shelf Valleys (SV); 3) Rocky Zones (RZ); and 4) Outer Basin (OB) (after Kelley and Belknap 1989:14).

- Nearshore Basins – shallow low-relief areas near the mainland;
- Shelf Valleys – long, narrow depressions extending from the Nearshore Basins;
- Rocky Zones – rocky regions with extreme relief (cliffs and boulder fields);
- Outer Basin – rocky seaward portion of the Bay (Kelley and Belknap 1989:3).

The Searsport Harbor project area is located within Penobscot Bay's Nearshore Basins region, where the transition from the shore to the basins is gradational and mudflats are common (Kelley and Belknap 1989:3). With the exception of bedrock outcrops and areas of pockmarks caused by escaping gas, the seafloor is generally smooth and muddy (Kelley and Belknap 1989:3–4).

Below the surface of the seafloor within the Searsport Harbor project area there are four basic stratigraphic units that researchers (Belknap et al. 1987; Kelley and Belknap 1989; Kelley et al. 1986, 1987a, 1987b; Knebel and Scanlon 1985; Ostereicher 1965; Schnitker 1974) have identified in Maine's coastal region:

A) Bedrock – acoustic basement that can be spiky or rounded and has no internal reflectors.

B) Till – unsorted, unstratified, glacially deposited mixture of fine and coarse rock debris that unconformably overlies bedrock and possesses highly irregular thicknesses and few internal reflectors.

C) Presumpscot Formation – well-stratified marine unit of glaciomarine muds ranging from approximately 15 to 80 ft (5 to 25 m) thick and overlying the till stratum that were deposited at the time of postglacial marine inundation of Maine between circa (ca.) 13,800 and 11,500 years before present (B.P.) as fine sediments that flowed from the ice sheet into marine waters became suspended and eventually blanketed inundated areas with silty deposits. The unconformity of its surface is very recognizable, occasionally has a channel form, and sometimes disappears beneath natural gas wipeout areas in sub-bottom profiler data. Stratum typically possess layers of sand at its base that was deposited in the initial high-energy setting near the melting glaciers.

D) Holocene muds/sands – acoustically transparent mud, or mud with dipping reflectors, to acoustically impenetrable sands that overlie the Presumpscot Formation. Stratum often contains natural gas, particularly within the upper reaches of the Penobscot Bay area.

Overlying sediments in the upper Penobscot Bay/Searsport Harbor area are supported by basement rock comprising the Penobscot Formation (O-Cp). The Penobscot Formation consists of complexly deformed Ordivician-Cambrian age metamorphic outcrops, mainly of sulfidic/carbonaceous pelite, and Devonian age (D1) intrusive volcanic rock bodies and granites that exhibit significant relief typical of ice scour and form the islands in the Bay (Anderson 1985;

Kelley and Belknap 1989:1). The Turtle Head fault zone several miles south of the Searsport Harbor study area separates the Penobscot Formation from the Ordovician-PreCambrian age Ellsworth Formation (OZe), a dominantly interbedded pelite and sandstone rock unit that extends farther south (Anderson 1985).

The Wisconsin glaciation (ca. 30,000–10,000 years ago) at the end of the Pleistocene Epoch had a profound effect on the geomorphology of the Searsport Harbor project area. As the LIS began advancing in a southeasterly direction, tons of "clastic" or fragmented stone debris embedded and transported in the LIS eroded and polished underlying bedrock and scoured valley and flat plains, reshaping the landscape before it. Glacial "drift" composed of "till," poorly sorted, unstratified deposits consisting of boulders, cobbles, pebbles, sand, silt, and clay that originated directly from the ice, as well as "stratified" deposits of morphologically differentiated, well-sorted sand and gravel created by running water in contact with ice (e.g., "kames" or "drumlins" and "eskers") were deposited along the glacier's base, sides, and terminus (Waters 1992).

These till deposits conform to the local bedrock topography and form most of the surficial deposits on land in the region, including sediments within the offshore project area. Where large meltwater channels formed in the ice, debris was sorted into narrow, sinuous eskers. Large systems of these eskers that occur throughout the region generally trend north-northwest to south-southeast and indicate the direction of ice retreat (Thompson and Borns 1985).

By the time the LIS reached its maximum extent ca. 22,000 to 20,000 years ago, it covered all of the State of Maine and most of the Northeast and had attained a terminal position off the coast at the present location of Georges Bank (Hughes et al. 1985). After a relatively brief period of oscillation between advances and retreats, the LIS began a net retreat northward across the Gulf of Maine at about 18,000 B.P. and reached an approximate position that was even with the present Maine coastline by around 14,000 B.P. (Figure 3-3) (Schnitker et al. 2001; Smith and Hunter 1989).

As the glaciers continued melting, the LIS retreated further northward across Maine's interior. Ice and sea remained in contact while sea level rose rapidly over the isostatically depressed crust southeast of the retreating glacier (Figure 3-4). Fine "rock flour" sediments flowing from the ice sheet into the marine flood waters became suspended and then settled. These fine sediments eventually accumulated across the inundated landscape as discontinuous ice-proximal glacial deposits collectively referred to as the Presumpscot Formation (Bloom 1960; Kelley et al. 1989:161). The rock flour mud Presumpscot Formation deposit typically possesses layers of sand at the stratum's base. These sand layers reflect the initial high-energy depositional setting near melting ice. Numerous radiocarbon dated fossils from the Presumpscot Formation indicate that the time of its deposition and the sequence of simultaneously occurring glacial retreat and marine submergence spanned an approximately 2,300-year period between about 13,800 and 11,500 B.P. (Kelley et al. 1989:160; Smith 1985).

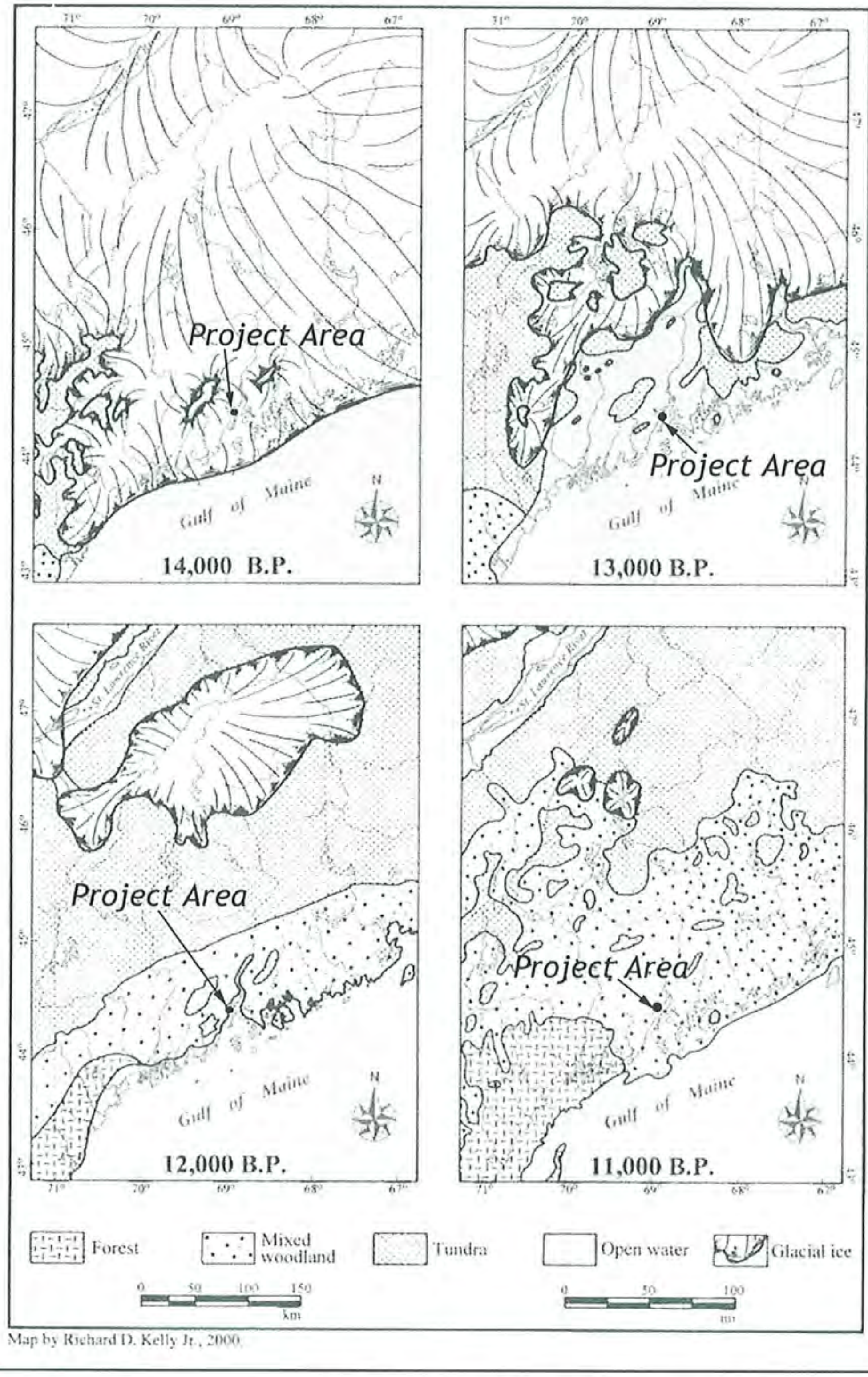

Figure 3-3. Retreat of Glacial Ice in Maine, 14,000-11,000 B.P., showing the location of the project area (source: Kelley 2000).

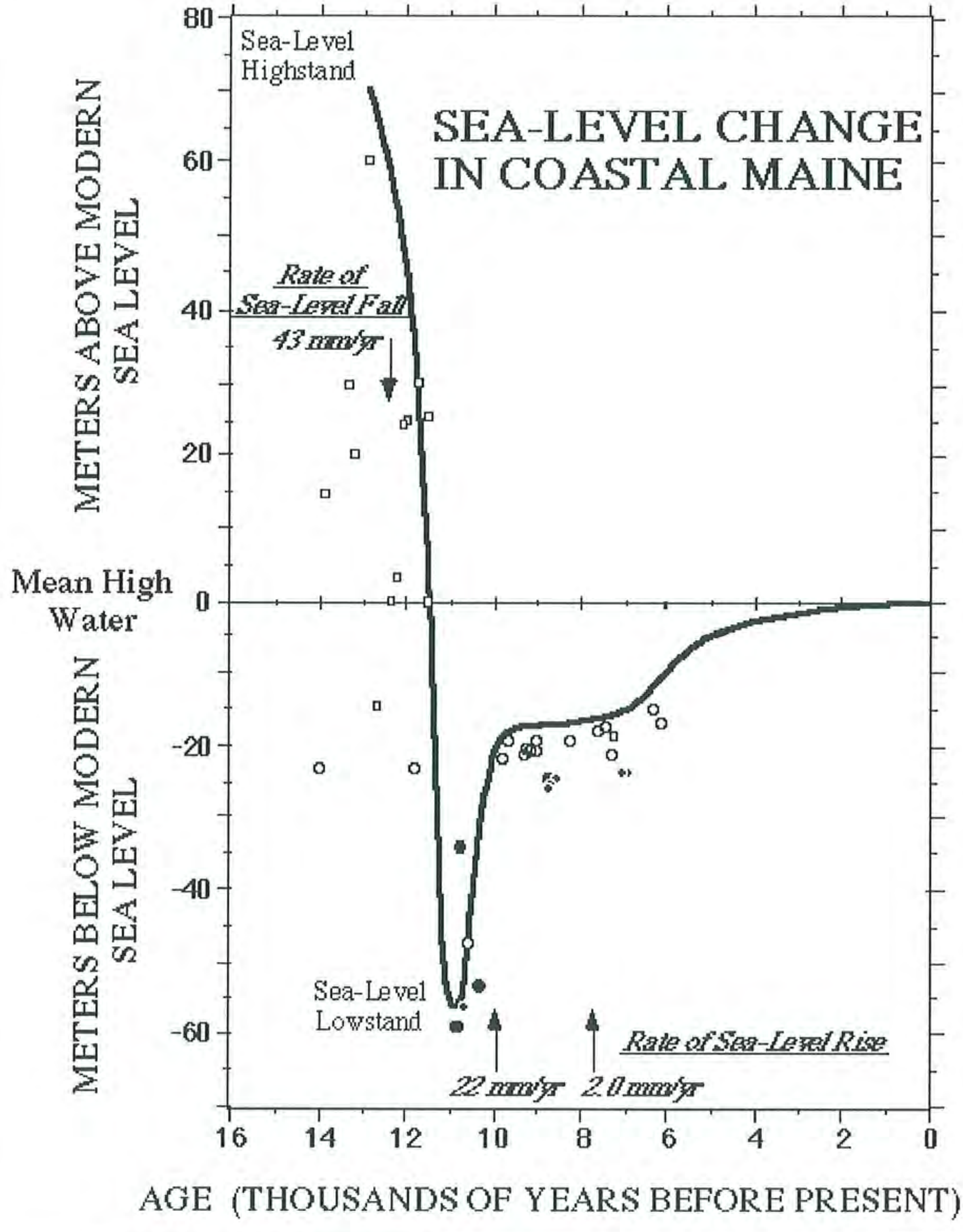

Figure 3-4. Maine's local relative sea-level curve for the past 14,000 years (Kelley et al. 2005).

Sometime between 12,600 and 12,400 B.P., the postglacial marine inundation of Maine reached its maximum and extended beyond Pleasant Point to as far north as Princeton, Maine and the Grand Falls Flowage (Smith and Hunter 1989; Stuiver and Borns 1975; Thompson and Borns 1985). As the land began to rebound at a rate greater than sea level rise, the ice sheet grounded (Smith and Hunter 1989), and shoreline features, such as sand and gravel deltas, formed near the maximum marine incursion. Delta deposits associated with this grounding have been mapped in more than 100 different locations at elevations from 193 to 422 ft (59 to 129 m) above mean sea level (amsl) on land throughout Maine, including north of the project area in Searsport where there is an esker-fed ice-contact delta deposit at an elevation of 293 ft (89 m) (Thompson et al. 1989:47, 66). The elevations of the deposits mark the approximate sea level in the area during the late glacial period.

The absence of any recognizable shoreline features cut into glacial sediments near the level of the water's high-stand suggests that the sea withdrew very rapidly as a result of isostatic rebound following the deposition of the Presumpscot Formation. Gates (1989:11) and others (Belknap et al. 1987; Kelley et al. 1992) estimate a postglacial isostatic vertical rebound of approximately 325 to 400 ft (100 to 120 m) occurred in coastal Maine between about 13,000 and 9000 B.P. The rapidly regressing coast is believed to have passed the position of the present Maine shoreline between 12,000 and 11,500 B.P. before reaching a lowstand of between ca. 180 to 213 ft (55 to 65 m) below modern sea level at around 9500 B.P. (Belknap et al. 1989:31–32; Crock et al. 1993:182). Steep seaward-sloping bedrock terrace margins, analogous to the modern Maine coast, which are present in 180 to 213 ft (55 to 65 m) of water, mark the level of the lowstand offshore (Belknap et al. 1989; Crock et al. 1993:182; Shipp et al. 1989:25–26). As the shoreline regressed seaward, rivers and streams incised valleys into the recently exposed till and marine sediments and a weathered, gullied, lag surface developed on the top of the Presumpscot Formation to a depth of approximately 30 ft (9 m) (Bloom 1963; Kelley et al. 1989:160). The unconformity on the Presumpscot Formation's surface is very recognizable in sub-bottom profiles when it is overlain by modern muds (Belknap et al. 1986; Kelley et al. 1987, 1989; Knebel and Scanlon 1985). Where the unconformity has been cored, sandy gravel lag deposits, in one case with pieces of wood radiocarbon dated to 7390 ± 500 B.P., have been found (Ostericher 1965). A vibratory core sample retrieved south of Sears Island contained similar detrital organic material (wood, bark, and grass fragments) (Belknap et al. 2002).

Most of the sediment that had existed in Penobscot Bay was reworked either during the Late Pleistocene regression or the Holocene transgression. Nearshore Basins concentrated in the upper reaches of the Bay (see Figure 3-2), such as that at Searsport Harbor, are protected by numerous islands and peninsulas, and are therefore, major environments of sediment deposition where important thicknesses of sediment were preserved (Kelley and Belknap 1989:4; Knebel 1985).

After reaching a lowstand approximately 9,500 years ago, eustatic sea level rise in the Gulf of Maine progressed rapidly initially, rising at a rate of approximately 42 ft (12.7 m) every 1,000 years between 9500 and 5000 B.P. (see Figure 3-4). Gullies and valley incisions cut into the Presumpscot Formation along river systems, such as the Penobscot River, filled with Holocene sediments and locally generated natural gas after they were transgressed by the sea (Crock et al. 1993:183; Kelley et al. 1989:160; Young et al. 1992:212). The overall rate of sea level rise along much of the Maine coast diminished drastically between 5000 and 1500 B.P., to an estimated rise of approximately 5 ft (1.44 m) every 1,000 years, and was followed by a further decrease to approximately 1.5 ft (0.5 m) every 1,000 years after 1500 B.P., (Belknap et al. 1989:85; Crock et al. 1993:183; Young et al. 1992:212).

Colonization of the region by flora during and after deglaciation is characterized by continuous changes, particularly between 14,000 and 9,000 years ago. This time frame is considered to be a marker of a transition from an open tundra-like environment to a woodland environment, and eventually a closed forest environment across much of the New England region (Davis and Jacobson 1985). Pollen and macrofossil studies from regional lake cores suggest species responded individually to climatic changes over time as the ice front retreated northward. Woodland vegetation, dominated by poplar and spruce, is believed to have spread along the coastal lowlands up to New Brunswick by ca. 12,000 years ago, and pushed into interior portions of the region by 11,000 years ago. As archaeologist Bruce Bourque notes, "An observer in Maine 11,000 years ago would have seen a mosaic environment of tundra, shrubs, and trees arranged in patterns determined by latitude, elevation, local soil conditions, drainage, and exposure" (Bourque 2001:16).

The transition from woodlands to closed forests initially began in southern Maine around 12,000 years ago, and then developed rapidly over the region between 11,000 and 10,000 years ago. The closed forests were initially dominated by spruce, balsam fir, birch, and poplar, but pine emerged as the dominant species approximately 1,000 years after closure of the forests. The simultaneous emergence of pine and the demise of spruce signaled a warming trend that reached its peak sometime around 5,000 years ago. Studies from lake cores suggest this warming trend was characterized by a drier climate and lower water levels, particularly between 8,000 and 6,000 years ago (Almquist et al. 2001). Cooler, wetter conditions prevailed after about 4,500 years ago, resulting in an increase in birch, followed by a return of spruce after around 2,000 years ago (Almquist-Jacobson and Sanger 1995).

Past archaeological research in northern New England has provided some indication regarding the range of environmental variables that most often correlate with human settlement and land-use patterns during both the pre-contact and post-contact periods. Contemporary modeling of pre-contact archaeological site locations has considered several environmental variables (e.g., proximity to water, topographic setting, soil type, and availability of natural resources), of which proximity to water ranks among the highest for predicting site location. To date, more than 95 percent of the recorded pre-contact sites in Maine have been identified along the margins of water bodies (Spiess 1992). Evidence for pre-contact human activity in the interior of Maine has commonly been found on level, moderately well-drained land surfaces near the shores of river, lakes, streams, and, sometimes, overlooking marshes and wetlands. These bodies of water would likely have represented important resource areas and transportation routes for pre-contact peoples. Along the coast, hundreds of pre-contact sites have been identified in Maine. Typically, these sites are located on southern or protected exposures adjacent to both fresh water and resource-rich areas, such as mud flats. The location of the proposed Searsport Harbor project fits the model for high potential pre-contact land use because of its location in a coastal setting adjacent to the confluences of rivers and streams flowing into the Harbor and Penobscot Bay.

Many of the same environmental factors that were attractive to pre-contact inhabitants were also attractive to Euro-American people visiting and settling in the area during the post-contact period. Early in the contact period, the area was favored as an excellent place to log, hunt, fish, trap, and trade with local Native populations. Rich fishing opportunities afforded by the convergence of fresh and salt waters at the mouth of the Penobscot River encouraged Euro-American exploration and exploitation of that resource as early as the 1500s (Eastman 1976:9–10; Spiess and Hedden 1983:10–11). Seemingly limitless forests of pine, spruce, oak, and tamarack, and the region's vast system of lakes, rivers, and streams that provided easily obtainable sources of power for the milling and transportation of lumber to deep water ports and shipyards along the coast, provided the necessary ingredients for the extensive shipping and shipbuilding industries that fueled Searsport's concomitant peaks in economic production and population during the 1860s.

Marine Transgression and Site Preservation

Generally speaking, episodes of marine transgression are essentially periods of erosion, a destructive process that creates less than ideal depositional sequences from an archaeological perspective (Belknap and Kraft 1985; Kraft 1971, 1985; Kraft et al. 1983, 1987). Marine transgression proceeds in one of two ways: by "shoreface" retreat, when the coastline slowly regresses inland, or by "stepwise" retreat, when in-place drowning of coastal features occurs (Waters 1992) (Figure 3-5).

Shoreface retreat describes the erosion of previously deposited sediments by wave and current processes as the shoreline transgresses and is the dominant inundation regime during the marine transgression process (Waters 1992). As the glaciers melted and sea level rose, beach face and shore face erosional zones that were south of Maine's present coastline and the Searsport Harbor project area sequentially passed across the subaerial portions of the outwash plain south of the harbor. Older sediments that had been deposited in coastal and terrestrial environments inland of the shoreline were reworked, first by the swash and backwash processes of the beach face and then by the waves and currents associated with the upper shore face breaker and surf zones (Figures 3-6 through 3-8). The erosion associated with the slow and continuous transgression of the sea reworked these deposits into a thin unconformable geological unit of transgressive lag (i.e., gravel and coarse sand deposits) forming the top of a time-transgressive geological unit known as the "marine unconformity" (i.e., the surface defined by the top of the buried paleosol and the base of the overlying marine deposit). Reworking terrestrial and coastal sediments are referred to as "palimpsest sediments" (Swift et al. 1971), and the erosional surface, marked by the depth of the maximum disturbance by transgression, is the ravinement surface. As noted above, this surface often shows up quite clearly in sub-bottom profiler data and can be a useful

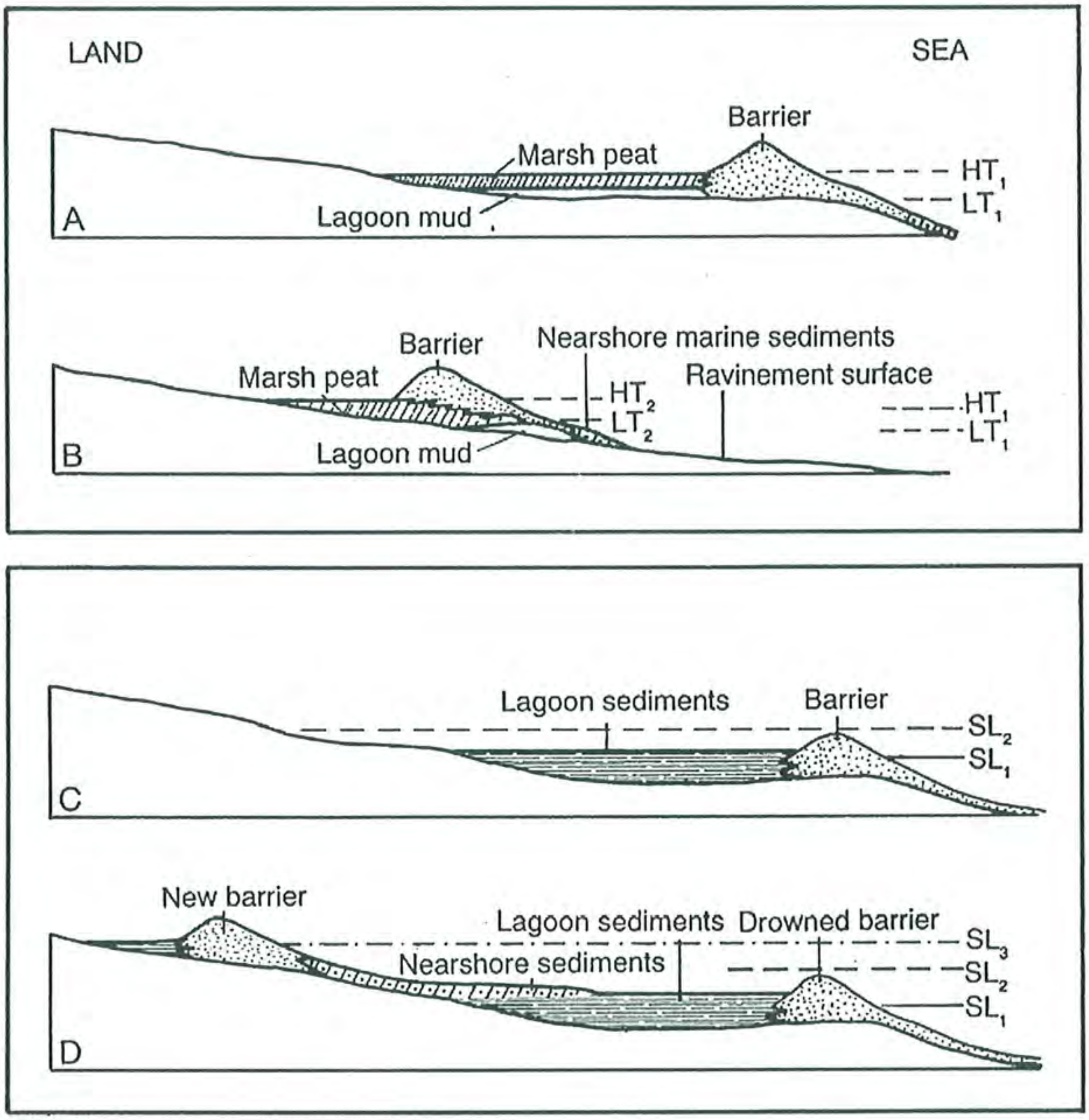

Figure 3-5. Two forms of marine transgression: shoreface retreat (A & B) and stepwise retreat (C & D) (Waters 1992:276).

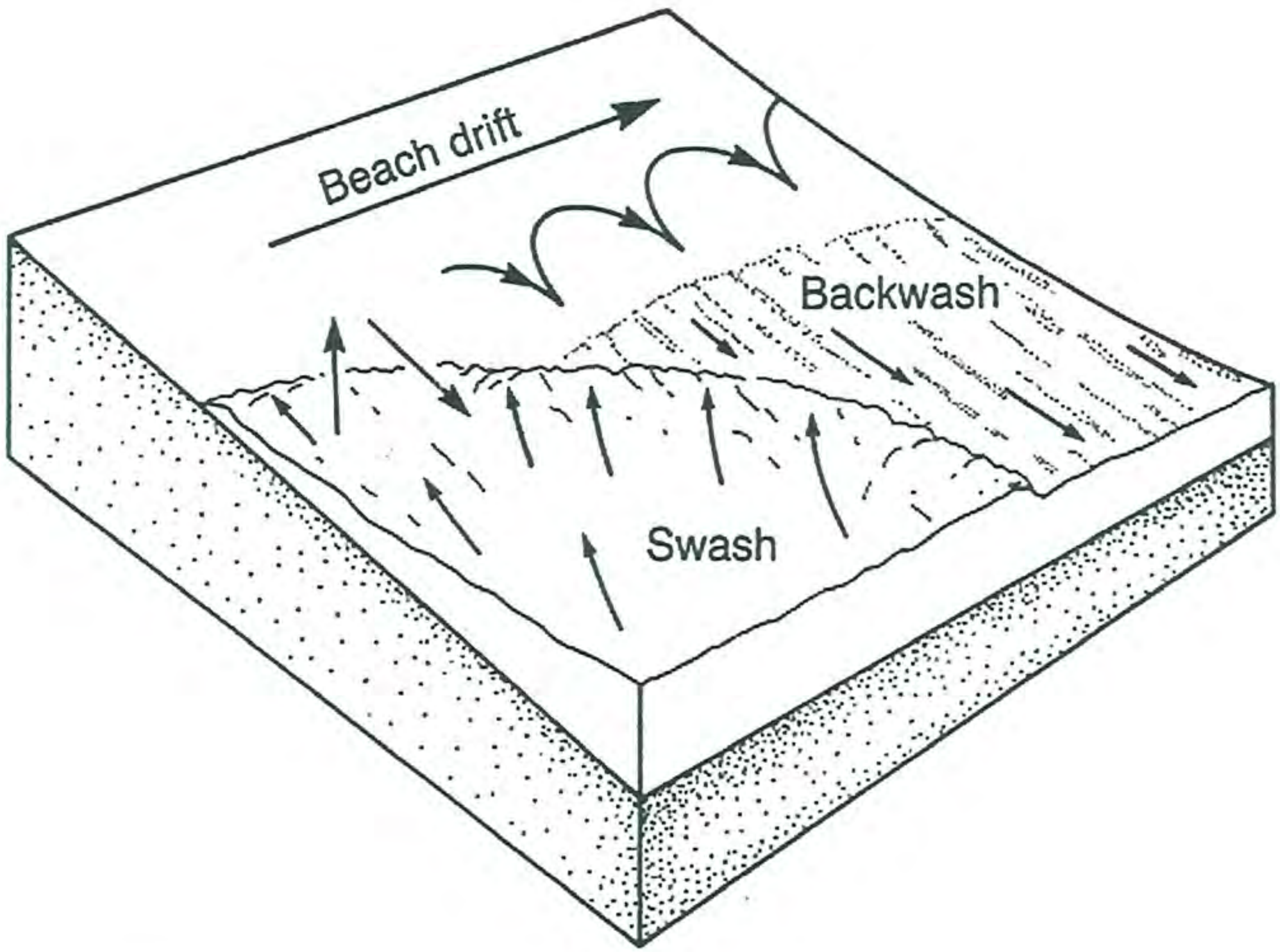

Figure 3-6. Beach drift erosion in the swash and backwash zones (Waters 1992:251).

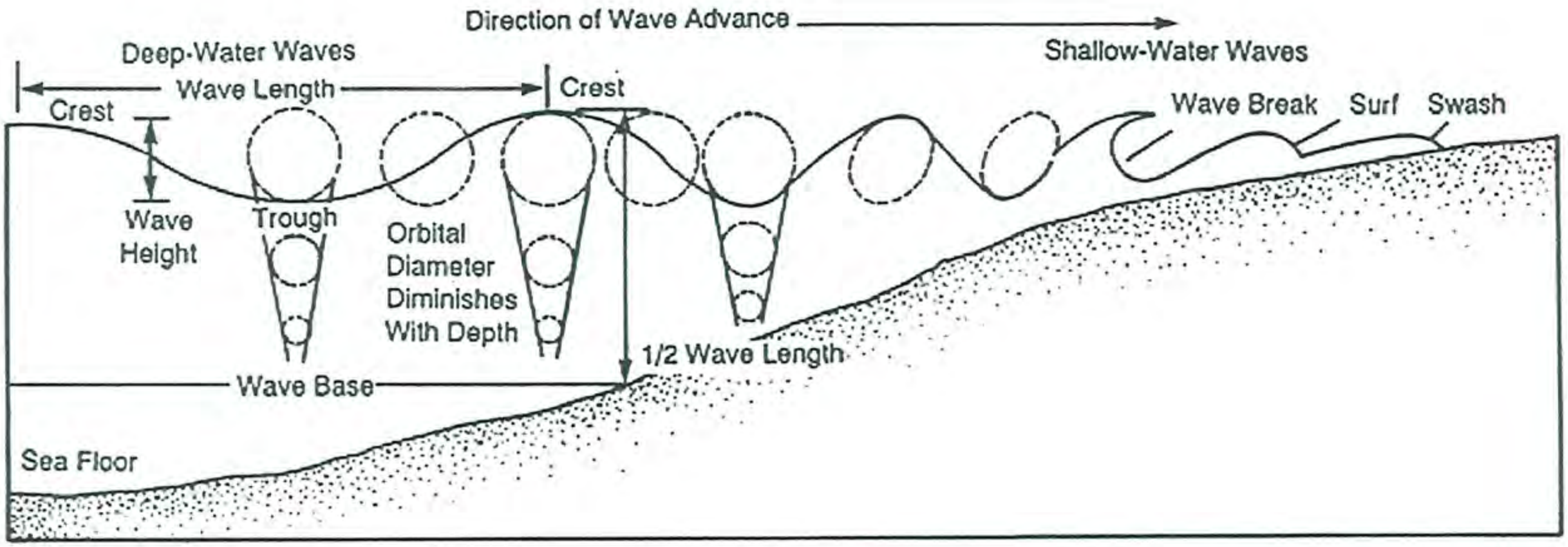

Figure 3-7. Wave formation processes causing erosion (Waters 1992:250).

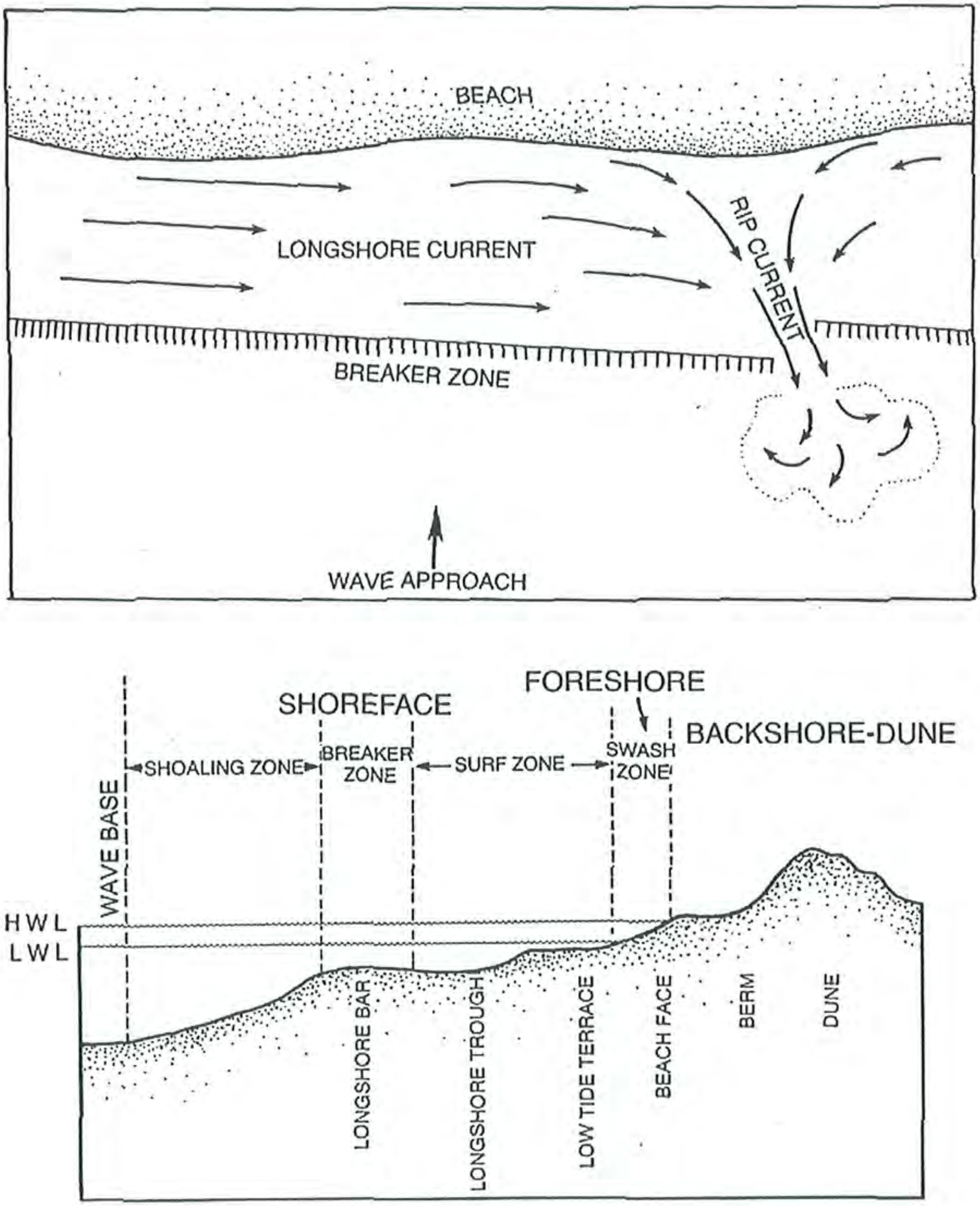

Figure 3-8. Longshore and rip currents along a coastline, and a diagram of the shoreface, foreshore, and backshore areas of a beach (Waters 1992:252, 257).

indicator for the presence of relict paleolandforms (Belknap and Kraft 1985; Kraft 1971; Waters 1992:276–277). Shore face retreat would probably have been the prevailing marine transgressive regime in Searsport Harbor, especially during stillstand episodes, and after ca. 4000 B.P. (middle of the Late Archaic Period), when the regional rate of sea level rise appears to have slowed considerably.

Alternatively and to a lesser extent, marine transgression also occurs by a process termed stepwise retreat, which is the sudden inundation or in-place drowning of coastal landforms and sediments (Rampino and Sanders 1980; Sanders and Kumar 1975a, 1975b). Stepwise retreat most commonly occurs at times and in areas of rapidly rising sea level, where the coast is quickly subsiding and the gradient of the transgressed surface is shallow. In this case, instead of the waves and currents of the shoreface and beach face sequentially reworking older sediments during transgression, the breaker and surf zones jump from the active shoreline to a point farther inland, submerging the older coastal landforms and sediments in an area seaward of the more destructive breaker and surf zones. The surf and breaker zones then stabilize and develop a new shoreline farther inland. Instances of in-place drowning during stepwise retreat, preserving forested uplands, barrier-island and lagoonal sequences, and other relict shoreline features, have been documented in a variety of places along the Atlantic coast (Rampino and Sanders 1980; Robinson et al. 2004; Sanders and Kumar 1975a, 1975b). Evidence of intact paleosol deposits from unprotected waters in excess of 1 or 2 miles (1.6 or 3.2 km) from shore in the Northeast has thus far proven exceedingly rare (John King, personal communication 2004).

One of the only documented instances of a contextually intact, stratified paleosol deposit being identified during a marine archaeological survey in New England was the discovery of such a deposit in a high-energy environment 8 to 10 mi (12.9 to 16.1 km) offshore in Nantucket Sound, using existing environmental data, sub-bottom profiles, and vibratory coring (Robinson et al. 2004). Evidence for the deposit consists of the contents of several cores recovered from loci within an area identified previously by PAL as having high archaeological sensitivity. Sub-bottom profiler reflectors that were present in this area were tested by coring and found to be produced by a distinct layer of intact paleosols (i.e., a partially reworked organic rich A_0-horizon of duff, overlying organic A-horizon soils, oxidized B-horizon soils, and C-horizon sub-soils) buried under approximately 6 ft (1.8 m) of reworking marine sediments (Figure 3-9).

Subsequent macro-fossil analyses of these cores identified several terrestrial ecozones (an upland deciduous forest floor, a shallow fresh or brackish water marsh, and a shallow freshwater pond or swamp). Organic material (a large piece of wood and a plant seed) from two of these cores was radiocarbon dated to ca. 4500 and 10,100 B.P. respectively (King, personal communication 2004). The results of the coring and dating corresponded well with the modeled locations of these ecozones at these approximate times, based on currently available local sea level rise models that had been applied to existing bathymetry. Utilizing this method of paleosol presence/absence detection has proven effective during other investigations conducted by PAL in other waters throughout the Northeast (Herbster et al. 2004; Leveillee et al. 2002; PAL 2003a, 2003b, 2004, 2005a, 2005b; Robinson and Ford 2003; Robinson and Waller 2002; Robinson et

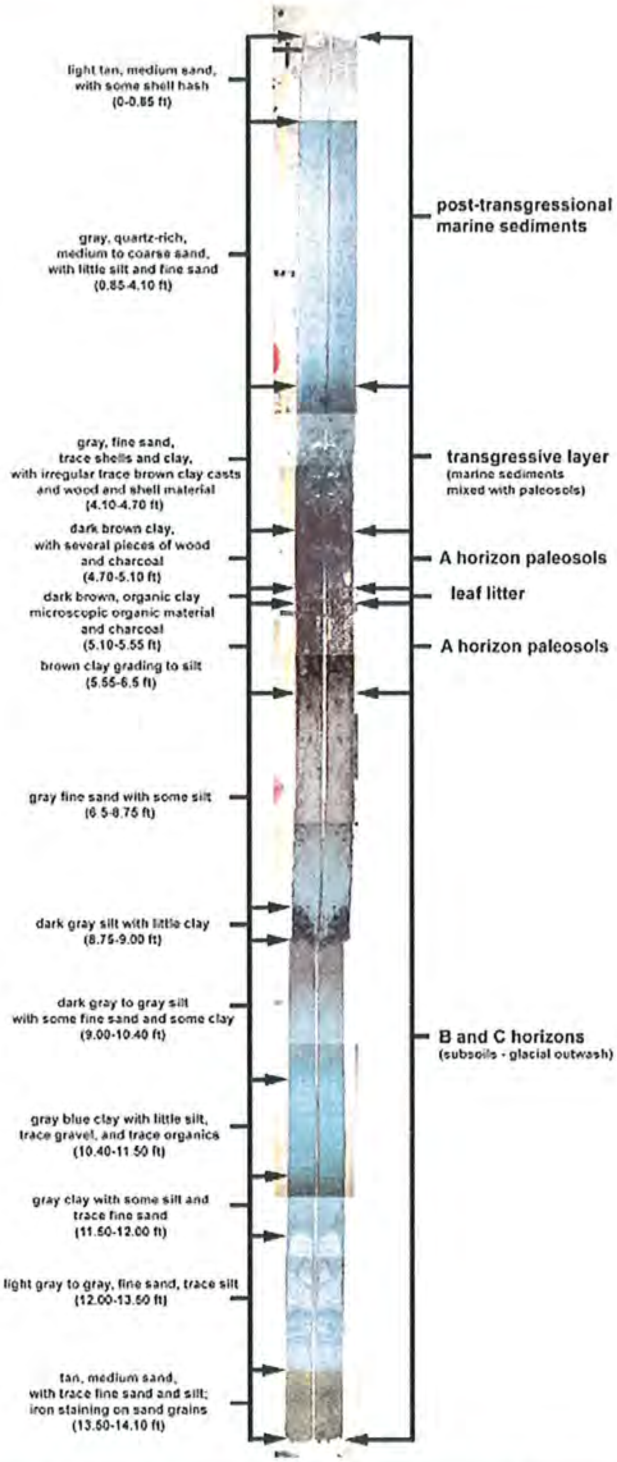

Figure 3-9. Vibratory core specimen recovered approximately 8 mi (12.8 km) offshore in the waters of southern New England containing a buried stratified deposit of archaeologically sensitive intact paleosols AMS radiocarbon dated by Woods Hole Oceanographic Institute to ± 5490 B.P. (Robinson et al. 2004:63).

al. 2004, 2005). Similar techniques have also been used by Klein et al. 1986, Fehr et al. 1996, Goodwin 2000, and Riess et al. 2003. Although shore face retreat is the dominant transgressive regime, isolated occurrences of stepwise retreat may have also occurred in portions of the Searsport Harbor study area. It would be these areas that have the greatest likelihood for containing archaeological deposits in relatively undisturbed, and therefore meaningful, contexts.

CHAPTER FOUR

CULTURAL CONTEXT

An understanding of regional long-term human settlement and subsistence practices is critical to assessing and interpreting the archaeological sensitivity and record of any project study area. The following chapter provides an overview of the pre- through post-contact culture history of the Searsport Harbor project area. This review is by no means exhaustive, but provides a general framework from which to predict and interpret archaeological deposits encountered during the marine archaeological survey of the project study area. The information for this context has been drawn from the review and synthesis of pre- through post-contact culture histories, previous archaeological investigations, and informant interviews.

Pre-Contact Period Culture History

The current inventory of known pre-contact sites documents a lengthy sequence of Native American settlement in coastal Maine and the nearby Maritime Provinces of Canada. The region is part of the larger Maritime Peninsula, a geographic formation and culture area that has been home to human populations for more than 10,500 years, and whose unique ecology influenced the pre-contact human groups who have lived there (Bourque 2001:xvii). Maine's archaeological record suggests a regional cultural history that is both complex and dynamic, and strongly linked to the resource-rich sea and the region's major rivers, including the Penobscot Bourque 2001). This is particularly true of the Native groups that lived on Maine's central and northeastern coasts beginning about 7,000 years ago (Bourque 2001:xvi). The importance of the sea to Maine's Native peoples continued even long after the initial contact period, as Native mariners were quick to adopt European nautical technologies and use sailing vessels for conducting trade and warfare far from their home territories (Bourque 2001:xvi; Duncan 1992:129–130; 144–147).

There is a considerable degree of consensus among archaeologists regarding broad patterns of regional cultural history throughout the Northeast, although debates continue about how and to what extent these patterns are related to each other over space and time. As a result of this consensus, the archaeological record of Maine has been organized into three major cultural periods: the PaleoIndian Period (11,500–9500 B.P.); the Archaic Period (9500–3000 B.P.); and the Ceramic Period (3000–450 B.P.). These periods are further subdivided based on similarities in artifact forms and cultural adaptations over broad regions (Table 4-1) (Spiess 1990).

PaleoIndian Period (11,500–9500 B.P.)

The PaleoIndian Period in Maine corresponds with a time when much of the landscape was vegetated in a mosaic environment of tundra, shrubs, and trees, the locations of which were patterned by latitude, elevation, local soil conditions, drainage, and exposure (Bourque 2001:16, 17). As the Searsport Harbor project area became free from its ice and water overburden, tundra vegetation (mosses, lichen, grasses, and sedge) appeared. Thickets of willow and alder, and then

Table 4-1. Maine's Comprehensive Planning Pre-Contact Period Archaeological Study Units (after Spiess 1990).

Time Period	Study Unit
11,500 - 10,200 B.P.	Fluted Point Paleoindian Tradition
10,200 – 9,500 B.P.	Late Paleoindian Tradition
10,000 – 6,000 B.P.	Early and Middle Archaic Traditions
6,000 – 4,200 B.P.	Late Archaic: Laurentian Tradition
6,000 – 2,000 B.P.	Late Archaic: Small-Stemmed Point Tradition
4,500 – 3,700 B.P.	Late Archaic: Moorehead Phase
3,900 – 3,000 B.P.	Late Archaic: Susquehanna Tradition
3,000 – 450 B.P.	Ceramic Period

stands of hardier trees, such as polar and spruce, followed (Bourque 2001:16). By 11,000 B.P., an intermediate woodland environment consisting of a mix of open areas of tundra and stands of closed-canopy poplar, spruce, and birch forest would have likely prevailed in the area.

Although Maine's late Pleistocene environment was generally similar to today's subarctic taiga (i.e., near treeline) or arctic tundra zones, it was probably biologically richer (Bourque 2001:17). In addition to its vegetation, Maine and the rest of the Northeast at this time supported a large and varied population of late Pleistocene mammal species that included mammoth, mastodon, horse, muskox, and caribou, as well as walrus, bearded seal, and cold-water species of shellfish, suggestive of a marine environment that was similar to that of the southern Labrador coast today (Bourque 2001:16).

Our understanding of subsistence and settlement patterns of PaleoIndians in Maine is growing and becoming more refined, although some of the even basic aspects, such as diet, geographic range, and dating of sites remain unclear (Bourque 2001:20). Part of the reason for this may be attributed to the poor preservation of organic remains in most terrestrial contexts in the Northeast, which has left a frustratingly small archaeological record, consisting of just stone, wood, charcoal, and calcined bone cultural materials available for interpretation. Another part of the reason may also lie in the paucity of marine archaeological research conducted to date focusing on the inundated paleolandscape and the pre-contact period submerged archaeological deposits it contains. Ironically, it is the least-studied landscape – the intact elements of the coastal environment of the PaleoIndian and Early to Middle Archaic periods that now lie offshore of the present Maine coast, and which, because of the submerged environment's uniquely preservative qualities, may hold the best evidence of Maine's earliest inhabitants.

Based on the currently available archaeological data recovered solely from the terrestrial context, archaeologists have characterized PaleoIndians as highly mobile hunter-gatherers who were largely reliant on caribou that were presumably abundant at that time (Spiess et al. 1998). While caribou would have been a principal focus for Maine's PaleoIndian population, they also invariably would have exploited a broad range of other resources that would have been available to them at the time (e.g., small mammals, fish, birds, and plants) (Bourque 2001:36).

Generally speaking, PaleoIndian Period peoples crafted tools from very fine lithic materials obtained from a limited number of sources scattered widely throughout the region. An abundance of exotic lithic materials at early PaleoIndian sites suggests frequent long-distance movement and/or broad-ranging exchange networks. Most PaleoIndian site locations that have been documented to date are quite different from those of later time periods, and are typically removed from present-day water bodies (Spiess et al. 1998). However, some of the more studied PaleoIndian archaeological deposits (e.g., the Munsungan Lake, Michaud, and Varney Farm sites), as well as the Magalloway Valley PaleoIndian Complex (the Vail and Adkins sites), described by archaeologist Bruce Bourque as one of the "richest clusters of PaleoIndian sites known anywhere in the Northeast" (Bourque 2001:27), are all proximal to areas with (or that once held) lakes, rivers, streams, brooks, or bogs.

PaleoIndian Period peoples seemed to have preferred sandy soils on which to locate their settlements. Such locations may have been chosen simply because they were relatively dry and well-drained, as compared to the otherwise wet early postglacial terrain (Bourque 2001:35). The sites seem also to be strategically located at points above low-lying terrain that may have been suitable habitat for caribou and other game animals. Maine's PaleoIndian archaeological deposits are typically indicative of short-term habitations by small groups of people, perhaps in some cases by even a single extended family. While smaller sites prevail, a handful of larger PaleoIndian sites are known to exist in the region as well, such as the Magalloway Valley PaleoIndian Complex (Vail and Adkins sites) in northwestern Maine (Gramly 1982, 1988), the Debert Site in Nova Scotia (MacDonald 1968), and the Bull Brook Site in Massachusetts (Grimes 1979; Grimes et al. 1984). It is hypothesized that these sites possibly represent seasonal gathering places for larger groups.

The end of the PaleoIndian Period and subsequent transition into the Early Archaic is poorly understood, although increasing perceptions of subtle cultural changes during the PaleoIndian Period have led some archaeologists to suggest a three-phase PaleoIndian occupation in Maine that may help explain some of these transitional differences (Bourque 2001:34–36; Wilson and Spiess 1990). Archaeological evidence indicates that during the later PaleoIndian Period, fluted spear points were replaced by smaller, unfluted points. Other point styles also emerge in the region, most notable of which are long, slender lanceolate points with a distinctive parallel flaking technology (Cox and Petersen 1997; Doyle et al. 1985; Will and Moore 2002). These technological changes coincide with the transformation of the environment from relatively open woodlands to more closed forests. By the Early Archaic Period, the archaeological record contains a dramatically different material culture than that recovered from sites dating to the PaleoIndian Period (e.g., abundant use of quartz, barbed bone spears, and a new range of implements [i.e., adzes, gouges, and whetstones] created by pecking and grinding less-brittle granular rock types) (Bourque 2001:37–74).

No PaleoIndian Period sites have been reported onshore on Sears Island or along the coast in Searsport Harbor. If such sites exist within the Searsport Harbor study area, rising sea levels have long since drowned or eroded them. The presence of an important PaleoIndian site (the Debert Site) off the Bay of Fundy coast in Nova Scotia (MacDonald 1968), suggests that PaleoIndians were present and familiar with the coastal Maritimes region and that future sites may yet be found, perhaps even underwater.

Archaic Period (9500–3000 B.P.)

Spanning around 6,500 years, the Archaic Period represents the longest archaeologically defined cultural period in the region, and is divided into three sub-periods (Early [10,000–8000 B.P.), Middle [8000–6000 B.P.], and Late [6000–3500 BP]). Based on inferences from artifact assemblages, the Archaic Period consists of a complex mosaic of cultures with varied lifestyles and wide reaching external relations (Bourque 2001:74). In general, the period is characterized by archaeologists as one in which there are important elements that remain continuous, but also sharp discontinuities as well, with evidence of arrivals and departures of distinct groups, and important changes in subsistence, mortuary practices, technology, and other patterns that are still being identified in the archaeological record.

In addition to the cultural changes that occurred during the Archaic Period, there were also dramatic changes in Maine's flora and fauna during this time. Paleontological studies indicate a time of global warming accompanied by a drop in precipitation known as the "Hypsithermal" period, which occurred between about 9000 and 5500 B.P. (McWeeney 1999:8). During the Archaic Period, woodlands replaced tundra, and boreal tree species (spruce, poplar, and birch) declined, and were followed by oak and eastern hemlock. Animal species that had sustained PaleoIndian hunters diminished and then disappeared altogether, to be replaced by fauna from unglaciated areas south and west of the region (e.g., moose, deer, bear, and other smaller mammals) (Bourque 2001:37).

Marine conditions in the Gulf of Maine also became increasingly favorable for biological productivity during the middle of the Archaic Period, as lower sea levels and shifts in the Gulf Stream and Labrador currents probably increased water temperatures, while decreasing tidal amplitudes, making them lower than today's (Bourque 2001:45). Paleontological evidence recovered from the eastern Gulf of Maine indicates that marine animal communities of the Middle Archaic were significantly different than today's, with warm-water species, such as oysters and quahogs, present in abundance (Bourque 2001:45).

The Gulf of Maine region may contain the largest number of radiocarbon-dated Early and Middle Archaic archaeological sites in New England, among the most diverse eighth millennium ground stone technologies in North America, and a well-established mortuary tradition of elaboration dating from as early as 8000 to 7000 B.P. (Robinson and Petersen 1993:61).

Subsistence and settlement patterns and the assemblages they produced were different from those of the PaleoIndian Period, as evidenced by the stronger correlation of sites with present-day water bodies, a lithic tool assemblage that included quartz cores and unifaces, ground-stone tools, such as abraders, choppers, stone rods, full channeled gouges, and low numbers of bifacially flaked lithic tools, and subsistence practices that are reconstructed as including an apparent spring seasonal emphasis on fish spawning runs, fishing for perch, sucker and eels, some hunting of large mammals, hunting or trapping of beaver, muskrat, woodchuck, various birds, and turtles, and the collection of a variety of plant resources, as evidenced by charred nutshells and seeds. That many sites dating from the Early Archaic occur along inland waterways suggests waterborne travel and fishing were important activities of Archaic Period peoples (Bourque 2001:42).

Unlike the prevalence of exotic lithic materials found in PaleoIndian assemblages, tools of the subsequent Archaic Period were typically produced from local stone, often collected in cobble form, and lack the finely crafted, chipped-stone spear points that characterize the PaleoIndian Period. Instead, scrapers, flake tools, and minimally modified unifacial tools made from quartz dominate the assemblages. Projectile points resembling forms common in the Carolinas, where they may have originated, appear during the Early Archaic, and include "bifurcate" points with notched bases as well as small amounts of the Kirk Corner Notched type (Bourque 2001:41). Additionally, a new stone tool technology (i.e., adzes, gouges, and stone rods used for whetstones) manufactured from less-brittle granular rock types through pecking and grinding techniques appears for the first time in Maine's archaeological record during the Early Archaic, and becomes increasingly elaborate through the period (Bourque 2001:42; Robinson 1992). Given that these stone tools are intended for woodworking, it may be inferred that their appearance and increased presence in the archaeological record reflects an expansion of wood technology that would presumably have included dugout log boats, food vessels, and fish weirs (Bourque 2001:42). In addition to tools manufactured from stone, tools made from bone and antler, including barbed spears, have also been found in small numbers from Early Archaic sites in Maine (Bourque 2001:41).

Mortuary practices first appear in the archaeological record of the Maritime Peninsula region during the Early Archaic Period, with three mortuary sites dating from ca. 8500 B.P. found in northern New England: 1) the Tableland Site on the Merrimack River, Manchester, NH; 2) the Morrill's Point Site at the mouth of the Merrimack River, Salisbury, MA, and 3) the Ormsby Site on the Androscoggin River, Brunswick, ME. All three sites contained cremation burials, although grave furnishings (i.e., red ocher and stone tools) were present just at the Tableland and Morrill's Point sites (Bourque 2001:43).

By the Middle Archaic Period, chipped-stone spear points, bifurcate projectile points, and heavy woodworking tools (occasionally supplemented by a southern type of grooved axe), all of which were present during the Early Archaic, become increasingly more abundant. Finely ground and polished winged spear-throwing weights, and stylistically local ground slate lance points and "ulus," which are a semi-lunar stone knife, also appear.

Middle Archaic sites occur in Maine's interior as well as along its coast, but even then are nearly always associated with bodies of water, suggesting a continued or growing dependence on fishing as an important subsistence strategy and a strong maritime focus. Most sites from the period are small and represent brief seasonal encampments of 25–50 individuals. Archaeological evidence of a coastal focus during the Middle Archaic is concentrated along the central Maine coast, where even islands were occupied — another clear indication for manufacture and use of reliable watercraft.

Mortuary practices of Middle Archaic peoples are poorly represented in the archaeological record of Maine and in New England in general, with only about five such sites identified (three of which are in Maine). The use of red ocher and inclusion of burial furniture (i.e., projectile points, spear-thrower weights, adzes, gouges, and stone rods) in Early Archaic burials continues in the Middle Archaic, as well. Taken together, these various technological and mortuary attributes of the central Gulf of Maine's Early and Middle Archaic cultures form a core of cultural traits that are distinct from cultural assemblages to the north and south. This distinctive nature has led archaeologists to label this Early and Middle Archaic pattern as the "Gulf of Maine Archaic Tradition" (Robinson and Petersen 1993:68).

The archaeological record of the Late Archaic Period in Maine is sparse for the sixth and fifth millennia B.P.; however, archaeological evidence of human occupation dating from about 5000 B.P. is much more abundant in the form of two distinct cultures from this period in Maine's pre-contact history: 1) the Vergennes phase, and; 2) the Small Stemmed Point tradition.

Vergennes phase culture sites are fairly common at interior locations between the Kennebec River and St. John drainages, and a few typical artifacts have been found as far northeast as Nova Scotia. The relative scarcity of Vergennes sites in New Hampshire, western Maine, and along Maine's coast, suggest that this culture's influence came primarily from the St. Lawrence Valley, and had an insignificant impact on the White Mountains region and coastal New England (Bourque 2001:46–49).

The robust Otter Creek spear point typifies the phase, and suggests reliance upon large terrestrial game, which is supported by the fact that Vergennes sites are confined to interior sections of the Northeast. Additional artifacts typically found on Vergennes sites include plummets, gouges, ulus, and flat rocks expediently chipped around their edges to create what archaeologists have termed "choppers." The significance of the Vergennes phase and its influence in Maine archaeology is debated, with some archaeologists seeing it as an intrusive culture of small, mobile hunting populations that originated in the St. Lawrence River valley, while others equate the culture's less formal tool styles and beautifully polished ulus as a technological continuation of those of Maine's coastal and near coastal Middle Archaic sites (Bourque 2001:46–49).

While Vergennes phase people mainly occupied Maine's interior upland areas and focused on terrestrial game, the Small Stemmed Point or narrow point tradition peoples mainly occupied the Gulf of Maine coast, where they practiced a mixed economy that included pursuit of large fish, such as cod and swordfish. The Small Stemmed tradition is characterized by archaeological deposits that have yielded thousands of small, narrow-stemmed projectile points, often found along with triangular points, both of which are generally made of quartz. Other associated stone artifacts include adzes, gouges, plummets, spear-thrower weights, and fully-grooved net weights. All of these artifact forms appear to have origins in the Middle Archaic. Small Stemmed sites found east of the Kennebec River pre-date by about 1,000 years the same types of sites located in southern New England. The earliest dated Small Stemmed sites in Maine occur in the central coastal region of the state, with the oldest coastal archaeological deposit (± 5290 B.P.) located in Penobscot Bay, on North Haven Island, south of the Searsport Harbor project area, in the Occupation 1 deposit at the important Turner Farm Site (Sanger and Kellogg 1989:119).

Available archaeological evidence indicates that between 5000 and 4500 B.P., the Small Stemmed tradition produced a striking new culture named for the pioneering Maine archaeologist, Warren K. Moorehead, who worked extensively on sites of this period. Termed the "Moorehead Phase," the most extensively studied site produced by this culture is the second component of the Turner Farm Site (Occupation 2), the contents of which were subjected to intensive analysis by Spiess and Lewis (2001) and provide a detailed record of subsistence activities during the centuries between ca. 4500 and 4000 B.P. The most striking element of the faunal assemblage from Occupation 2 is the abundance of swordfish remains, which although present on other sites, were first found at Turner Farm, and thereby provided the original indication of this formidable prey's importance. Other major food resources present at Occupation 2 included cod, deer, and shellfish – both the soft-shelled clam and the locally extinct quahog or hardshell variety. Noticeably absent from the assemblage were shallow-water fish species and sea mammals, such as seals and porpoise, which apparently were little used. Together, the evidence examined at Occupation 2 indicates the presence of a substantial year-round population at the site, who used it as a home base. Generally speaking, Moorehead Phase sites are only found east of the Kennebec River.

In addition to its distinctively coastal settlement pattern, the Moorehead phase is primarily known for its mortuary practices, which included the lavish use of red ocher, giving rise to the term "the Red Paint People," and the offering of grave goods, such as gouges, slate spear points, and stone rods (Moorehead 1922; Robinson 1992; Willoughby 1898). Present understanding of how the Moorehead phase culture may have developed focuses on its relationship to the marine environment. Sometime between 6000 and 4000 B.P., as the biological productivity of the Gulf of Maine reached high levels, a local population settled along the coast of central and eastern Maine to exploit the region's rich resources and growing stocks of cod and swordfishes, developing a highly distinctive material culture and unprecedented mortuary ceremonialism along the way (Bourque 2001:51–61). Surprisingly, the innovative and highly successful Moorehead phase maritime hunting peoples disappear abruptly from the archaeological record at around 3800 B.P., and don't seem to leave any vestiges of their culture in those that succeeded them locally.

The Moorehead phase was replaced at the close of the Late Archaic Period by another distinct cultural tradition, known as the Susquehanna tradition. Susquehanna tradition sites appear in Maine's archaeological record between 3700 and 3400 B.P. (Bourque 1995, 2001; Sanger 1979).

Initially recognized by archaeologists working in the Susquehanna River valley region of southern New York and eastern Pennsylvania, Susquehanna tradition sites are widespread throughout eastern North America and are common in Maine, occurring as far east as the St. John River in New Brunswick, with a few Susquehanna tradition artifacts recently recognized from sites across the Bay of Fundy in southern Nova Scotia (Bourque 2001:62).

Once again, the Turner Farm Site proves to be the best source of data about this distinctive culture, with the largest and richest Susquehanna archaeological deposit in Maine comprising Occupation 3 there (Bourque 2001:62). The Susquehanna tradition's technology, subsistence practices, and mortuary rituals are striking in their uniformity and marked difference from those of preceding cultures. Diagnostic tool forms of the Susquehanna tradition are the largest and most skillfully manufactured stone artifacts of the pre-contact period. Susquehanna artisans excelled not only in their production of chipped-stone tools, but also worked bone by grinding, as opposed to scraping with a stone tool, as was done during the Moorehead phase. Susquehanna craftspeople also produced ground- and pecked-stone tools such as adzes and gouges, which were functionally similar to those of earlier cultures, but were different in their detail and in their use of different lithic materials, and lithic bowls sculpted from steatite, a soft, easily worked, metamorphic stone.

The Susquehanna culture was also distinctly different from the Moorehead phase in its diet, preferring terrestrial game and "mast" resources (i.e., nuts, acorns, beech nuts, butternuts, hickory nuts, and walnuts) to maritime resources, as is evident from the Turner Site Occupation 3's faunal refuse remains and diet indicators resulting from isotopic analysis of the site's human skeletal population (Bourque 2001:62–66).

The Susquehanna tradition's elaborate mortuary rituals differed dramatically from those of the Moorehead phase's Red Paint People. Despite a very large number of Susquehanna habitation sites throughout Maine, only a half-dozen or so Susquehanna cemeteries have been identified in the state, as compared to the 44 known cemeteries associated with the Moorehead phase culture. This difference may be attributed to two factors: Susquehanna occupation of the region was too brief to generate a larger number of burials, and/or, unlike the Moorehead cemeteries which included all members of their populations, the Susquehanna tradition's burial practices were more exclusive. However, age and sex do not appear to have been a basis for burial in the Susquehanna cemetery at Turner Farm. Other major distinctly different elements of the Susquehanna tradition burials are the "ritualized manipulation of the dead," consisting of the removal of whole or partial human remains from their place of initial interment to combine them with the remains of other individuals for ceremonial use in bundle burials or commitment to cremation pyres along with rich arrays of grave furnishings (Bourque 2001:62–66).

Archaeological evidence of the Susquehanna tradition disappears from the archaeological record in Maine by about 3400 B.P. This disappearance coincides with a "Little Ice Age" (McWeeney 1999:10) and a transition in the temperate southern character of Maine's woods back to northern hardwoods and hemlock of a colder climate, which may have resulted in a southward territorial contraction of Maine's Susquehanna tradition population.

The relationships between the various Late Archaic traditions continue to be a source of debate among Maine archaeologists. At the root of the discussion is whether the various archaeological assemblages of the Late Archaic reflect local, long-term cultural adaptations, or movement of people into the region with different cultures. Whatever the origins of the cultural changes observed, they again roughly coincide with increasing changes in the environment that provided more favorable habitat for deer and possibly other modern species of fauna as well.

Ceramic Period (3000–450 B.P.)

The introduction of pottery manufacture and use in Maine defines the onset of what Maine archaeologists call the Ceramic Period (Sanger 1979). In other parts of the Northeast, this cultural period is referred to as the Woodland Period. The differences between the two terms is mainly that hunting and gathering for food remained the primary means of subsistence throughout much of Maine and the Maritimes, while a reliance on horticulture and a tendency toward larger, more permanent settlement patterns developed in other regions during the same time period. Ceramics first appear in the archaeological record of Maine around 3,000 years ago and they persist until contact with Europeans when clay pots were replaced in favor of iron and copper kettles that were traded for beaver pelts and other animal furs.

The picture that emerges from Ceramic Period sites is one showing long-standing cultural adaptation to the diversified use of local resources. In addition, the nature of artifact forms and certain types of stone recovered from Ceramic Period sites indicate broad trade and communication networks with peoples located far to the north, south, and west. By the end of the period, historical and archaeological evidence suggests horticulture was practiced in southern Maine. The Ceramic Period ends with European contact around 450 years ago. At this time, most of the artifacts attributable to pre-contact inhabitants of Maine disappear from the archaeological record.

New England and the Maritime provinces during the Ceramic Period and at the time of European contact were populated by Eastern Algonquian speakers, and Maine's major river drainages were occupied by the Eastern Abenaki (Snow 1978a:67). The name of the Eastern Abenaki derives from *wapanahki*, their own name for themselves, which means "dawn land people" or "easterners" (Snow 1978b:137). The Eastern Abenaki dialect spoken within the Penobscot drainage was Penobscot. The territory of the Eastern Abenakis was covered by a mixed white pine, hemlock, and hardwood forest along the coast, transitioning to a spruce and fir forest in the interior. Neither the soil nor the climate was adequately warm enough to allow for cultivation of the available domesticates (Snow 1978b:138). Consequently, the subsistence pattern of the period primarily involved a seasonal round of hunting and gathering with summer residences based along the coast and winter residences in the interior. Native peoples living in the Penobscot River drainage and along the Maine coast exploited springtime runs of alewives, salmon, shad, eel, smelt, and other fish with hooks, leisters, pursenets, and weirs. Some fishing was done with harpoons, particularly for sturgeon, which were attracted to the surface by torches at night. Harpoons were also used to hunt harbor seals, porpoise and various water fowl.

Lobsters and crabs were caught in shallow water using spears. Shellfish, particularly clams, were a staple of native coastal inhabitants (Snow 1978b:139). Coastal peoples living in the Penobscot River drainage were quite mobile as compared to other Eastern Algonquians, and utilized canoes made from birch bark for travel, hunting, and fishing.

Ceramic Period sites are abundant in Maine, along both the coast and in the Maine interior (Sanger 1979). Along the coast, they are most visible in the form of shell middens, which have attracted the attention of professional and amateur archaeologists since the late nineteenth century (Wyman 1868). Shell midden sites contain discarded shells of clams, oysters, mussels, and quahogs, bones of both terrestrial and marine animals, as well as broken pottery sherds and discarded stone and bone tools. Sites in the interior are most common along waterways, ponds, and lakes. Assemblages from the interior differ from coastal sites in that bone assemblages are poorly represented because of differences in preservation.

Contact/Post-Contact Period Culture History

Undocumented visitations by Norse explorers, coastal fishermen from many nations, and adventurous woodsmen may have occurred in the Searsport area prior to its settlement by non-Native peoples. The first documented evidence of European incursion into the Penobscot Bay area is that of the French-sponsored explorer and Italian navigator Giovanni da Verrazano, who sailed along the Maine coast in 1524 while searching for a northwest passage to the Pacific and the wealth of China and the Spice Islands that would rival the Portuguese route around the Cape of Good Hope (Duncan 1992:22). Verrazano found the natives of this coast (near present day Casco Bay), hostile, unlike those he had encountered farther south, suggesting that they had previous unpleasant dealings with Europeans (e.g., Portuguese fishermen who had been in Penobscot Bay ca. 1522 [Brasser 1978:80]) who had perhaps been slave traders or dishonest merchants. The clearest evidence for Verrazano's presence in or near Penobscot Bay is the label at the head of one of the large inlets on his brother's map indicating the location of the Abenaki's fictitious beautiful city of gold – "Oranbega," later called "Norumbega," situated on the present site of the city of Bangor (Duncan 1992:22).

European exploration of the Penobscot River itself – the only major northeastern estuary penetrated before 1529, was completed by Spain's Estevan Gomes the year after Verrazano's voyage, when he sailed up the Penobscot River as far as present-day Bangor, before realizing that it was just a river with a broad mouth and not the much sought after entrance of a northwest passage to the Orient (Baker et al. 1992:xxv). The native peoples that greeted Gomes were, apparently, more friendly than those Verrazano met the year before, although tales of Norumbega, the City of Gold, were either uncompelling to Gomes or went untold, as the area as depicted on his map from the voyage is inscribed with the words, "no gold here" (Duncan 1992:23). Despite Gomes's pronouncement, the alluring imaginative concept of a northern El Dorado - the paradisiacal Native American kingdom of Norumbega at the head of Penobscot Bay - was sustained throughout the middle sixteenth century by the Bay's prominence on early maps, Verrazano's idyllic description of native encampments, and boosting of the legend of a mythical city at the head of the Penobscot by French explorer Jacques Cartier following his three voyages to Canada in the 1530s (Baker et al. 1992:xxv). Ironically, Gomes repaid the relative friendliness of Maine's native inhabitants by capturing a group of them (58 people) to bring back to Spain with him (Brasser 1978:80).

In addition to the lure of wealth and discovery of a northwest passage, the English were attracted to the region for other reasons as well. Under Sir Humphry Gilbert's direction, the English planned to build a naval station and a manorial settlement in Norumbega from which they could, among other things, harass Spain's West Indian holdings (Baker et al. 1992:xxv). The English plan of colonization was put into action when Gilbert's expeditionary five-ship fleet got underway in June 1583 to establish England's first permanent settlement in America. The effort ended prematurely shortly thereafter, however, when in September, after failing to even make the Maine coast, Gilbert's boat sank with all hands while trying to return home to England. Despite its subsequent failure, the expedition was the first serious attempt at English colonization in America and in Maine (Duncan 1992:26).

French and English incursions into the area continued unabated through the seventeenth and eighteenth centuries as the two nations struggled with each other and the area's native inhabitants for control of the region through a series of armed conflicts and treaties. In 1603, King Henry IV of France granted the Atlantic Coast from the Hudson River to Cape Breton to Pierre du Guast, Sieure de Monts with instructions to "explore, govern, open mines, and Christianize the Indians" (Davis 1950:19). Sieure de Monts established briefly occupied settlements first on St. Croix Island in 1604, and then at a more favorable location across the Bay of Fundy at present-day Digby, named "Port Royal," by the French, who remained there only until 1607 during the initial settlement attempt.

Three years later, King James I of England gave much of the same area to the Plymouth Company. A settlement was established in 1607 by the English in the middle of the grant at Sagadahoc, near present day Phippsburg, Maine, although it was abandoned the following year. Meanwhile, France was adding Mount Desert to its short list of settlements along the coast. Upon hearing of the French settlement there, a force commanded by Captain Samuel Argall, an English colonist from Virginia, was sent to drive off the French. Destruction of the French settlements foreshadowed a long-lasting campaign of violence between the French and English as they fought each other for dominance in the New World.

Prior to European contact, the population of the Abenaki (excluding the Penacook and Micmac) may have been as high as 40,000 (20,000 eastern; 10,000 western; and 10,000 maritime). Disease brought by Europeans, however, decimated the Native population. Early contacts with European fishermen resulted in at least two major epidemics among the Abenaki as early as the 1500s: 1) an unknown sickness sometime between 1564 and 1570; and 2) typhus in 1586. The highest rate of Native mortality resulting from European-borne disease occurred during the decade just before English settlement of Massachusetts in 1620, when three separate epidemics swept across New England and the Canadian Maritimes. Maine's Abenaki were hit especially hard in 1617, when a 75 percent mortality rate prevailed, and the population of the eastern Abenaki plummeted to about 5,000 individuals (Sultzman 1997).

In 1620, the Plymouth Company was reincorporated by the King to rule, order and govern "New England," a territory that included the coastal lands from Philadelphia to Central Newfoundland. Nine years later, in 1629, the seeds of Searsport's development were sown when the land comprising present day Waldo County (in which Searsport is located), became part of the "Muscongus Grant," a grant issued to John Beauchamp of London, and Thomas Leverett of Boston by the Plymouth Council. The land comprising the grant extended along the seaboard between the Muscongus and Penobscot rivers and encompassed nearly 1,000 square miles (2,589 square kilometers [sq km]) (Claes 1985:2–3). Beauchamp and Leverett established a trading post at present-day Castine, although it was soon taken over by the French. Conflicts such as King Phillip's War in 1675, King William's War of 1689, and Queen Anne's War of 1702 largely prevented extensive settlement of the Muscongus Grant lands. With the signing of the Peace of Utrecht in 1713, however, conditions became more conducive for settlement in the area. During that time, Beauchamp died, and Leverett gained complete control of the grant. He then passed down this control to his son, John Leverett, governor of Massachusetts, who then, in turn, passed down the grant to his grandson and Harvard president, John Leverett, great-grandson of the original grantee, in 1714.

The year 1719 witnessed temporary peace in the area and Leverett pursued measures to resettle and reorganize his patent by parceling the land into 10 shares in common, which conveyed to a group referred to as the "Ten Proprietors." These proprietors in turn admitted 20 more proprietors, among who were Cornelius and Jonathon Waldo of Boston, and Jonathon's son, Samuel Waldo. The Waldos received a parcel amounting to 100,000 acres (405 sq km), and, under their direction, two plantations (the first permanent settlements within the parcel) that eventually became Thomaston and Warren, were established. Efforts on the part of the proprietors to build two small settlements on the St. Georges River, consisting of block houses, sawmills, and a few houses succeeded; however, war broke out again the next year (Dummer's War), and the settlements were burned by the area's Native inhabitants. In response, Massachusetts sent two expeditions up the Penobscot to destroy Native villages there. By the end of Dummer's War, many members of the region's surrounding tribes had left, but the Penobscot did not, and although they couldn't claim victory, they retained control of the Penobscot River drainage and even managed to establish their own navy with captured European vessels (Snow 1978b:143–144). Three trading posts were subsequently established in the area and operated in an effort to improve relations with the Native population.

When peace returned in 1725, the proprietors began laying plans to resettle the land. These plans were challenged by a Royal Surveyor General of the King's Woods, David Dunbar, and Samuel Waldo was sent to England to argue the proprietors' case to the King in Counsel. Waldo prevailed in the case, and was rewarded by the other proprietors for his effort with a one-half share of the entire grant. The Muscongus lands became Waldo's main focus in life. After purchasing two-thirds of the remaining shares, the grant came to be referred as the "Waldo Patent" (Eastman 1976:15). In addition, Wassumkeag Island (today's Sears Island), was renamed "Brigadier's Island," after its new proprietor, who was made Brigadier General while serving under William Pepperell on the Louisburg Expedition (Figure 4-1).

Figure 4-1. Brigadier (General) Samuel Waldo (1696-1759), namesake of Brigadier's Island (i.e., present day Sears Island) and Waldo County (Eastman 1976:14).

The open conflict waged between English, French, and Native elements during the French and Indian War (1754–1763) again curtailed settlement of the Maine lands of the present-day Searsport area, and its outcome forever changed the cultural landscape of the region. When the war broke out, the Penobscot initially remained formally neutral and urged other tribes to do so as well. The English eventually forced the war upon the Penobscot, and offered huge scalp bounties for those of the Penobscot. The war ended with the expulsion of the French from North America in 1759, and the loss of most of the Penobscot's territorial rights to the English. In 1764, ownership and control of the lower Penobscot River drainage was assumed by the English. Control of the middle section of the drainage was wrested from the Penobscots by 1796, and by 1833, the entire drainage was no longer the domain of the Tribe (Snow 1978b:138; 144–145).

Until the fall of Quebec in 1759, there were few settlements east of Pemiquid, except for those of the fishermen on Monhegan and Matinicus (Duncan 1992:190). The eastern part of Waldo's lands were in Penobscot, District of Maine, Province of Massachusetts; a portion of Maine that Massachusetts had essentially ignored defending during the French and Indian wars. This was the case until Massachusetts governor Thomas Pownall decided to undertake an expedition to retake the eastern lands and build a fort on today's Fort Point to control the land adjacent to and within the waters of the Penobscot River. Unfortunately for Waldo, he died prematurely of a stroke before the fort was constructed.

The fort was completed in 1759 and named Fort Pownall in honor of the Massachusetts governor. A brisk trade was initiated with the local Native peoples, and with the War over and the fort completed, a steady stream of settlers flooded into Maine. Between 1761 and 1790, Maine's population rose from about 17,500 to 96,000 (Duncan 1992:190). Land around the fort was purchased and settled between 1760 and 1770, mainly by workers from and members of the garrison, farmers and lumbermen driven eastward by severe forest fires that had raged in western Maine between 1761 and 1762, and families from Rhode Island and Connecticut (Duncan 1992:190). As these lands filled with English settlers, they were organized as the Frankfort Plantation, No. 2, County of Lincoln, Commonwealth of Massachusetts. This large area also included the present towns of Prospect, Stockton Springs, Searsport, as well as much of Hampden, and Frankfort (Ellis 1980).

Maine's new coastal communities survived by sending firewood, sawn lumber, shooks, staves, shingles, clapboards, and hay in sloops and schooners to the nearby ports of Boston, Portsmouth, Salem, and other towns to the west to be used locally or re-shipped to the West Indies. Vessels carrying these cargoes were typically small, usually under 50 ft (12 m) in length and less than 30 or 40 tons burden. Larger vessels weren't needed, because of the simple fact that Maine's settlements at that time were neither producing enough to fill them or able to spare the manpower for the larger crews necessary to sail them (Duncan 1987:191).

Unlike the French and Indian War, the American Revolution attracted, rather than repelled, settlement of the Maine lands, as many assumed that the old royal grants would be forfeited and the lands would open to the people. Consequently, many moved in and staked a claim by squatting on the property they desired to own. The War, however, eventually reached Penobscot Bay and forced out the area's residents just as had previous conflicts (Eastman 1976:10).

In 1775, British forces dismantled Fort Pownall before local rebels burned what was left to prevent it from getting into the hands of the enemy. In 1779, the British landed on Bagaduce Peninsula, present-day Castine, to begin building a fort of their own. In response, Massachusetts dispatched a fleet of 19 warships and 24 armed troop transports carrying 900 troops to drive away the invaders. The Penobscot Expedition, as it was called, was led under the command of Dudley Saltonstall of the Continental naval forces, and Solomon Lovell, of the Continental army. While the Expedition represents the only significant Revolutionary War naval effort on the Maine coast, it is arguably the worst naval defeat suffered by American forces prior to the attack on Pearl Harbor. As a result of incompetence and cowardice on the part of the forces' commanders, 17 American vessels were destroyed or captured by a fleet of four British ships without having ever fired a shot (Duncan 1992:228–233). Sears Cove, on the east side of Sears Island, contains the burned and sunken remains of the American brig, *Defense*, site of the first comprehensive underwater archaeological excavation ever undertaken in the United States.

Once the Revolutionary War was over, former residents of the area returned, along with a rush of new settlers attracted by the lure of free land. By 1784, 24 families were residing in the southern half of Frankfort (i.e., present day Searsport), and in 1790, the year of the first U.S. Census, six families were squatting on Brigadier's Island.

The squatters' hope of free land on Brigadier's Island wasn't without basis, because the land was held in part by Waldo's son-in-law, Thomas Flucker, a loyalist who had fled the country with most of his family. Flucker's daughter, Lucy, however, had married Henry Knox, the Secretary of War and one of George Washington's generals during the Revolution (Figure 4-2). Knox apparently applied his influence to eliminate the claims of other heirs and obtained full title of the land for his wife. The validity of the Waldo Patent was later confirmed by the Legislature in 1785, and its dimensions approved in 1798.

Residents of Frankfort petitioned the Massachusetts General Court in 1789 to be incorporated as a town – specifically including Brigadier's Island within their boundaries, and asked that name of the town be changed to "Knoxbury" in recognition of Henry Knox's contributions to the town. The Legislature approved the incorporation, but required the old town name of Frankfort be retained (Figure 4-3). Five years later (1794), residents of Frankfort petitioned the Legislature again to request that a portion of the town be set off from the rest of Frankfort to create a new town named Prospect, after the beautiful view of Penobscot Bay visible from the top of Mount Prospect, known today as Fletcher's Hill (Ellis 1980). The Legislature approved the request, and the town of Prospect was incorporated. Its boundaries included present-day Stockton and most of present-day Searsport (Figure 4-4).

The same year (1794), Knox traveled to Sears Island to buy off the remaining squatters at 10 shillings each, and gave each of them a year to vacate the property. Knox then moved to

Figure 4-2. American Revolutionary War General and Secretary of War, Henry Knox (1750-1806) (Eastman 1976:20).

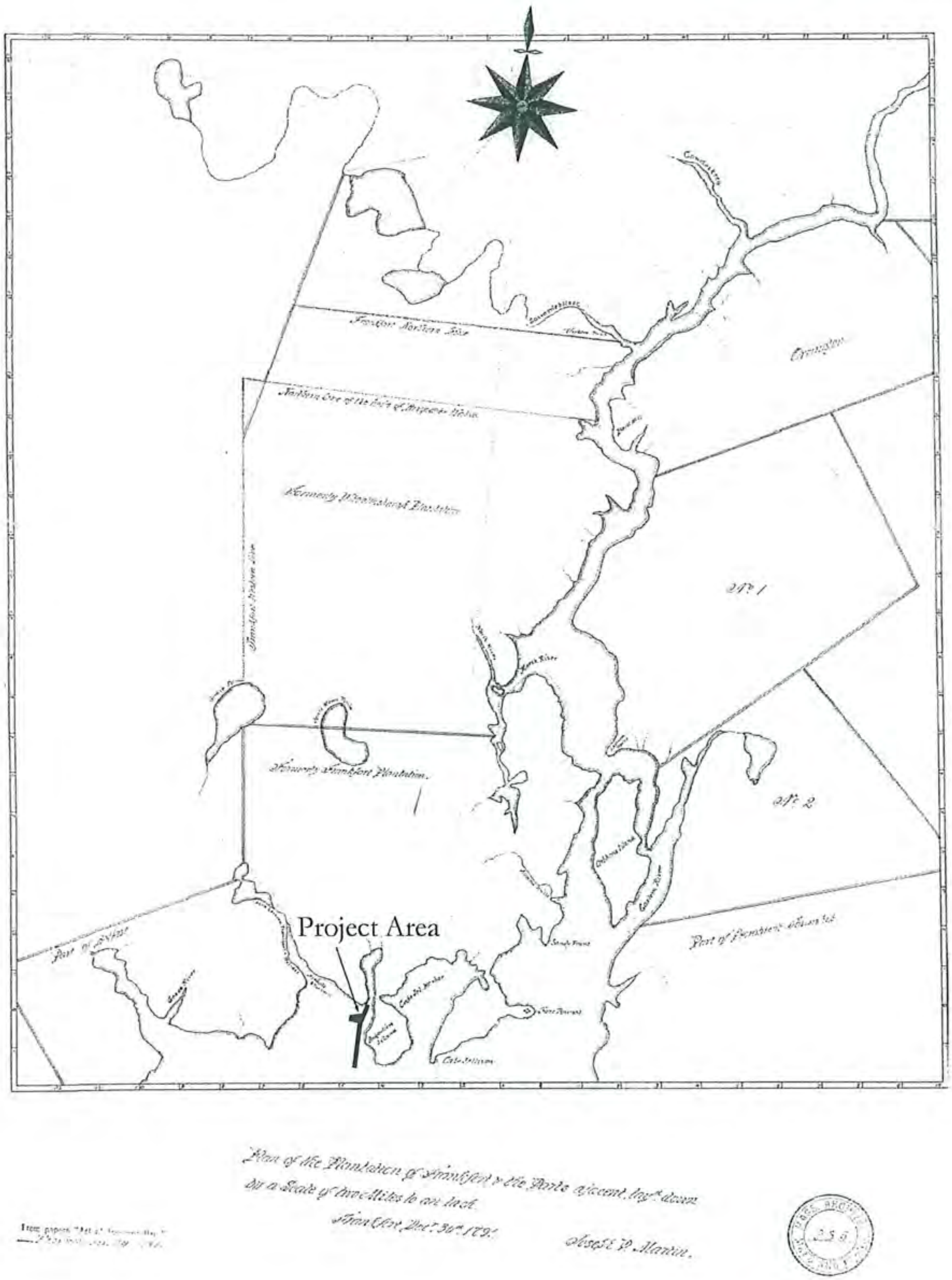

Figure 4-3. 1791 map of the newly incorporated town of Frankfort, Maine (source: Martin 1791).

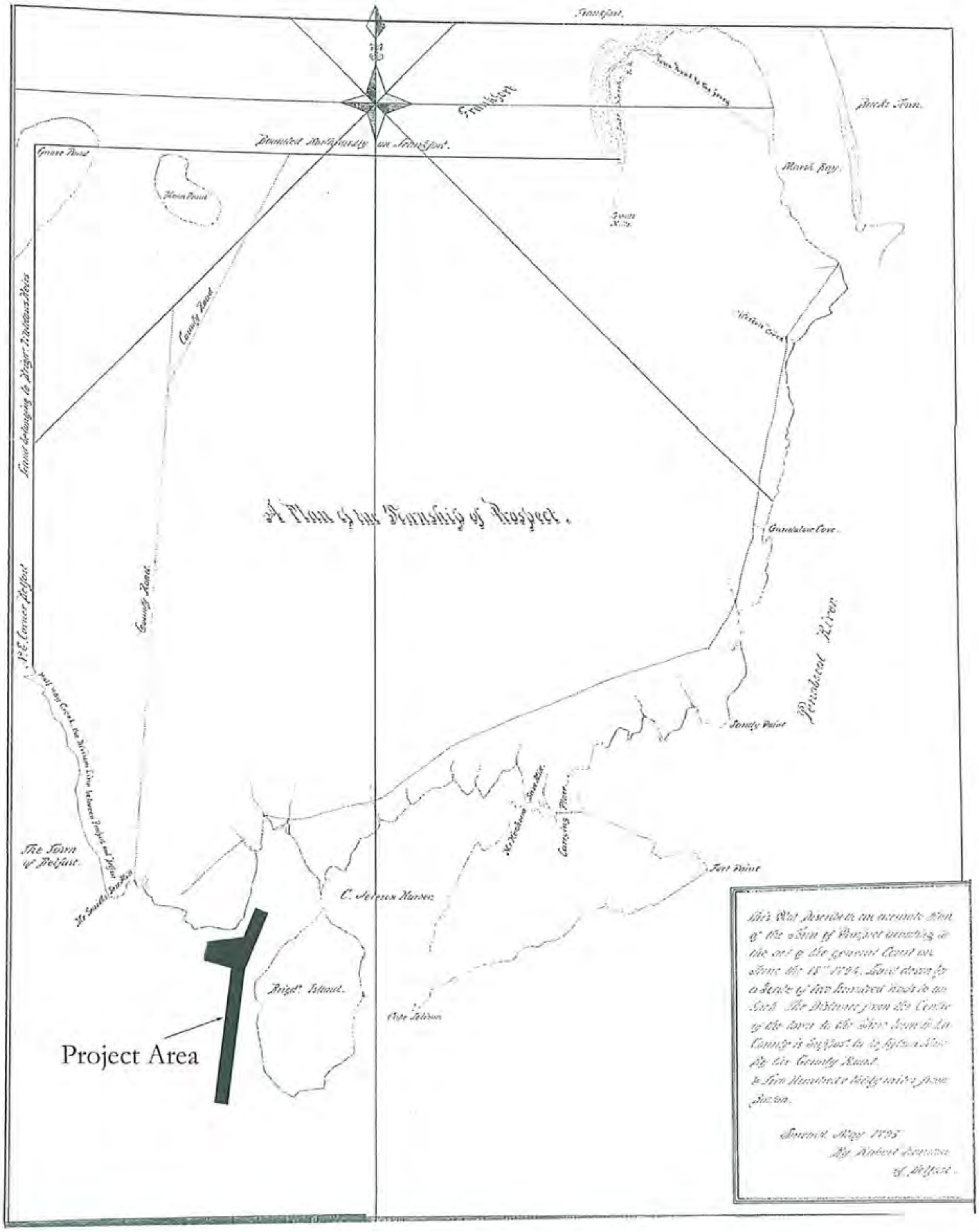

Figure 4-4. 1795 map of the newly incorporated town of Prospect, Maine (source: Houston 1795).

Marine Archaeological Survey, Searsport Harbor, May 2007

Thomaston in 1795 to begin developing the St. George area. He also hired John Rynier, a gardener, to turn Brigadier's Island into a "breeding ground for improving cattle and sheep." The inventory of buildings on the island at that time included a house, a barn, and a fish house. Part of Rynier's development plan was to exploit the fishery as the squatters had done to help defray costs of the project. In May of 1798, 148 salmon were caught in the Sears Island weirs, and a cellar was begun for a new house or barn.

In circa 1800, Knox experienced financial difficulties and was forced to divest himself of the Brigadier's Island (Sears Island) property. The island was eventually sold to a partnership that included David Sears from Boston. In 1813, Sears bought out partners, and the island was managed as a farm and for its timber. Ownership of the island passed from Sears to his son, David Sears II, and then to his grandson, David Sears III. Between 1844 and 1845, David Sears II purchased land on Bar Point (now Kidder Point), and the island took the Sears name (Figure 4-5). Eight years later, his son, David Sears III, built a summer house on the island. Between 1871 and 1874, ownership of the island changed hands a few time before David Sears IV became its owner. Sears IV summered on the island and increased the size of the farm before leasing it to Levi Dow as a cattle farm. Fish weirs around the island remained in operation during the late nineteenth century and were used by Dow in May and June of each year to catch and sell fish. In the 1880s, the Sear Island house burned and the island was used as an informal campground and outdoor recreation area (as it is today).

Tremendous economic growth came to the region in the wake of Jefferson's economically disastrous Embargo Act, the cessation of War of 1812 hostilities with Great Britain, and Maine's separation from Massachusetts in 1820. Lumbering, traditional fishing, and shipbuilding pursuits entered a boom period, as ice harvesting, granite and lime quarrying also developed into important regional industries.

Prospect and Frankfort became a part of the State of Maine when Maine became a state in 1820. Prospect was taken from Hancock County and annexed to Waldo County, which was incorporated in 1827 (Ellis 1980:27). The town of Searsport officially came into existence, separating from Prospect and Belfast with its incorporation in 1845.

It was Searsport's proximity to the Penobscot River estuary and the region's rich natural resources of timber and fish that drove the town's principal commercial and industrial interests. During the apex of Searsport's commercial development in the mid-1800s, the town boasted eight shipyards that launched several early types of wooden vessels (i.e., schooners, sloops, brigs, barks, barkentines, and ships). In addition to its natural resources, Searsport was rich in skilled human resources, as well, with 286 vessel masters calling the town home throughout its seafaring history (Searsport Celebration Committee 1970). In 1885 alone, one-tenth of America's full-rigged ships were commanded by Searsport captains (Searsport Celebration Committee 1970).

The record of shipbuilding in Searsport reflects the post-contact settlement of the region and the growth of communities that were an important factor in development of the American merchant

Figure 4-5. David Sears II (1787-1871), namesake of Searsport and Sears Island (Eastman 1976:30).

marine (Table 4-2). Simple quantitative analyses and histograms of the results from historian Lincoln Colcord's 1932 inventory of archival records on shipbuilding activity in Searsport reveal some interesting patterns in the town's shipbuilding activity.

Colcord documents the construction of 232 wooden sailing vessels in Searsport between 1792 and 1891 (inclusive of the years prior to the town's 1845 incorporation) (Colcord 1932). The pace of shipbuilding activity in Searsport expanded rapidly over a 40-year period between 1810 and 1850, reaching a peak during the 1840s when 59 vessels averaging 176 tons slid down the ways and into Searsport Harbor. Changes in the relationships between the numbers of vessels built and their average tonnages as distributed by decade over a 100-year period (1790–1889) are apparent (Figures 4-6 and 4-7), as are shifts in the distributions of different vessel rig types as built by decade over the same period (Figure 4-8). These patterns of change are instructive in that they reflect concomitant shifts in the complexion and purpose of Searsport's shipbuilding industry over time that can be tied to larger patterns in America's economic and technological history. Based on these statistics, Searsport's shipping history can be divided into four broad periods:

1) 1790–1820: fore-and-aft rigged schooners and sloops averaging 100 tons or less built for coastwise trade with Boston, New York, and Baltimore;

2) 1820–1850: fore-and-aft and square-rigged schooners, brigs, and barks averaging 100-200 tons built for coastal, West Indies, and Gulf coast trade;

3) 1850–1880: square-rigged brigs, barks, barkentines, and ships averaging 250-750 tons

Table 4-2. Vessels Built in Searsport 1790–1889.

YEAR	1790-1799	1800-1809	1810-1819	1820-1829	1830-1839	1840-1849	1850-1859	1860-1869	1870-1879	1880-1889	Totals
# Vessels Built	3	4	12	23	37	59	41	33	15	3	230
Average Vessel Tonnage	66	98	94	110	125	176	198	442	763	273	
Bark	0	0	0	0	0	9	17	13	6	0	45
Barkentine	0	0	0	0	0	0	0	0	1	0	1
Brig	0	0	0	0	4	27	13	10	0	0	54
Schooner	2	3	11	23	33	22	6	6	3	3	112
Ship	0	0	0	0	0	1	5	4	5	0	15
Sloop	1	1	1	0	0	0	0	0	0	0	3

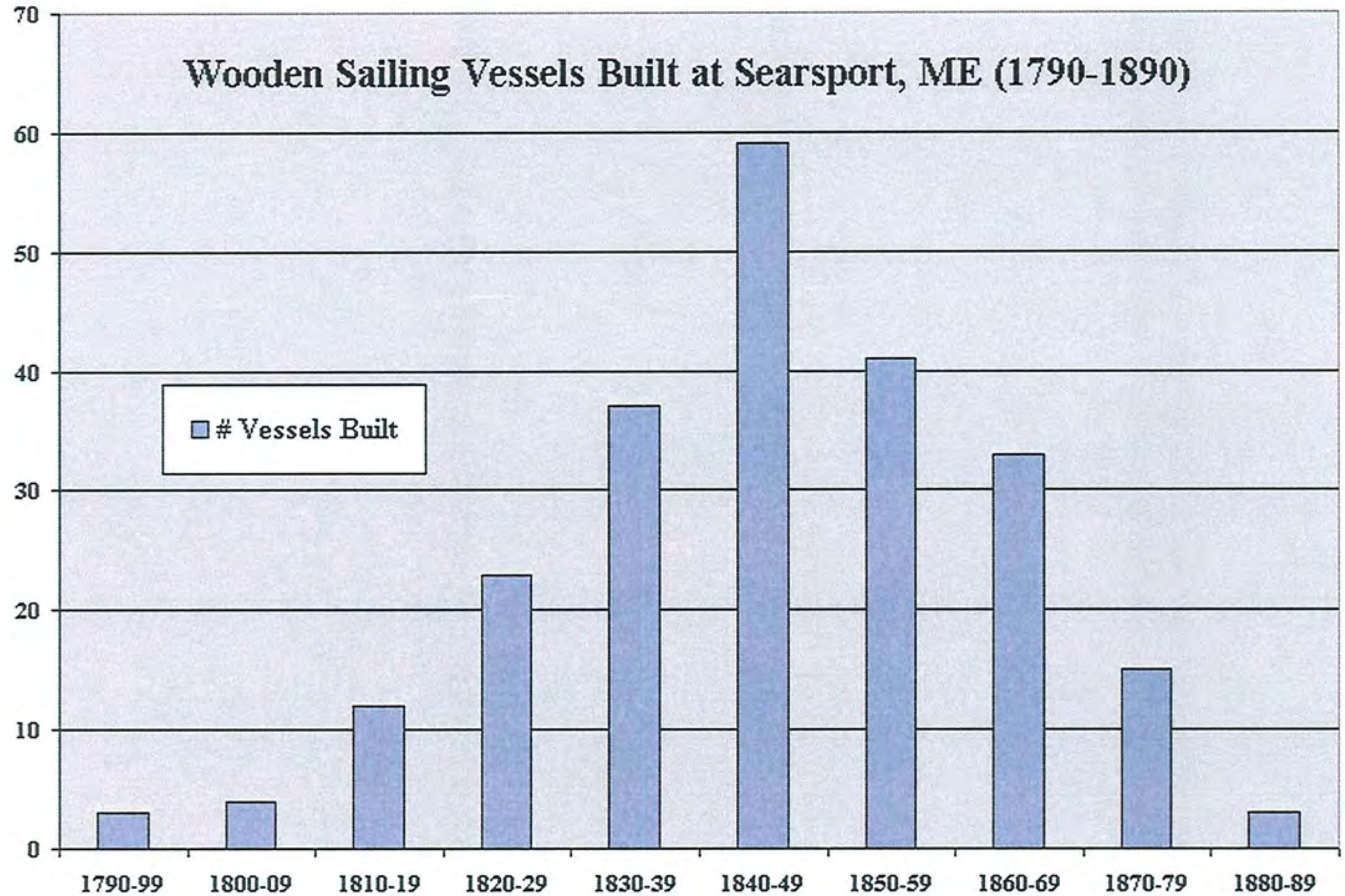

Figure 4-6. Wooden sailing vessels built at Searsport (1790-1890) (based on data from Colcord 1932).

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Sloop	1	1	1	0	0	0	0	0	0	0	3

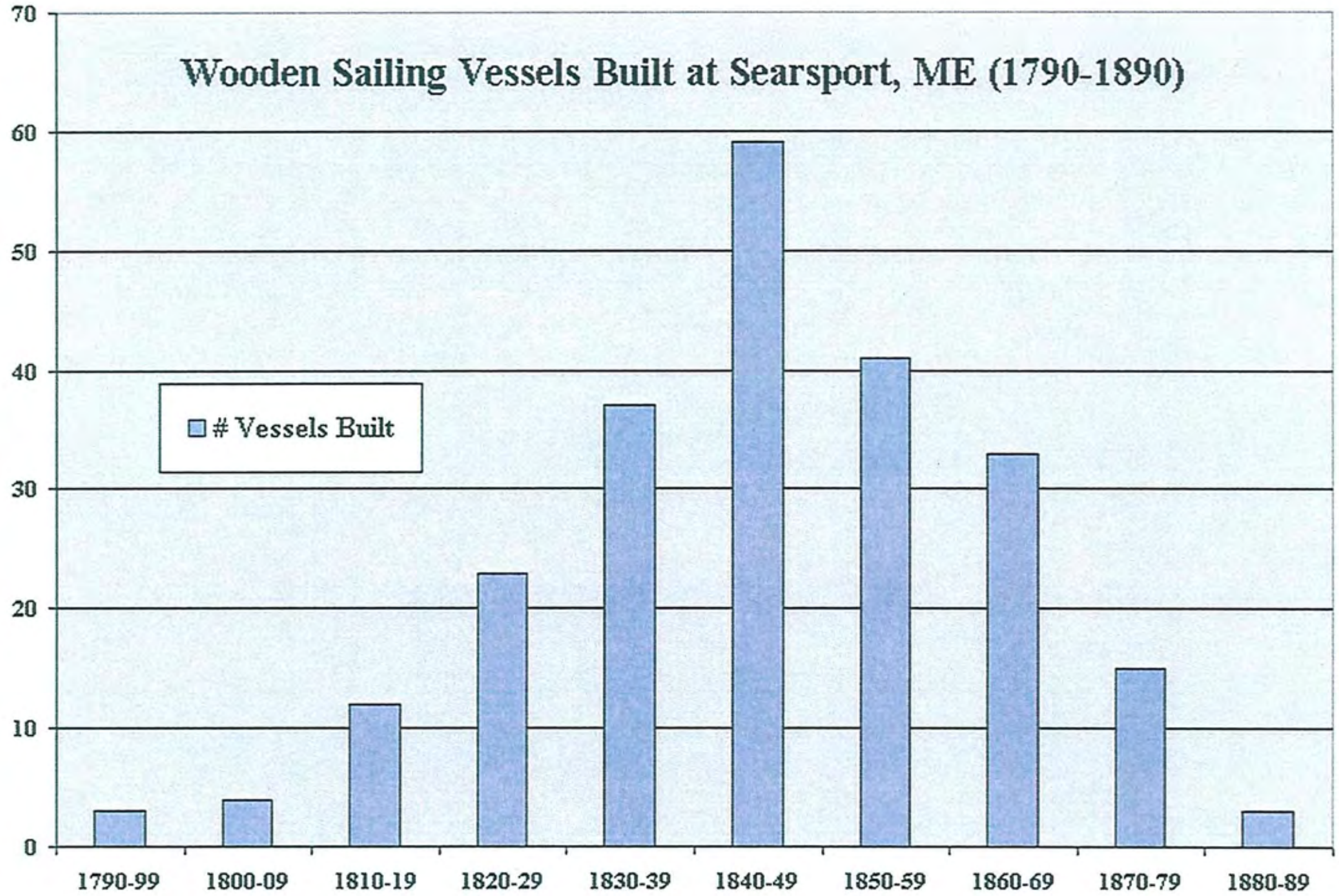

Figure 4-6. Wooden sailing vessels built at Searsport (1790-1890) (based on data from Colcord 1932).

Marine Archaeological Survey, Searsport Harbor, May 2007

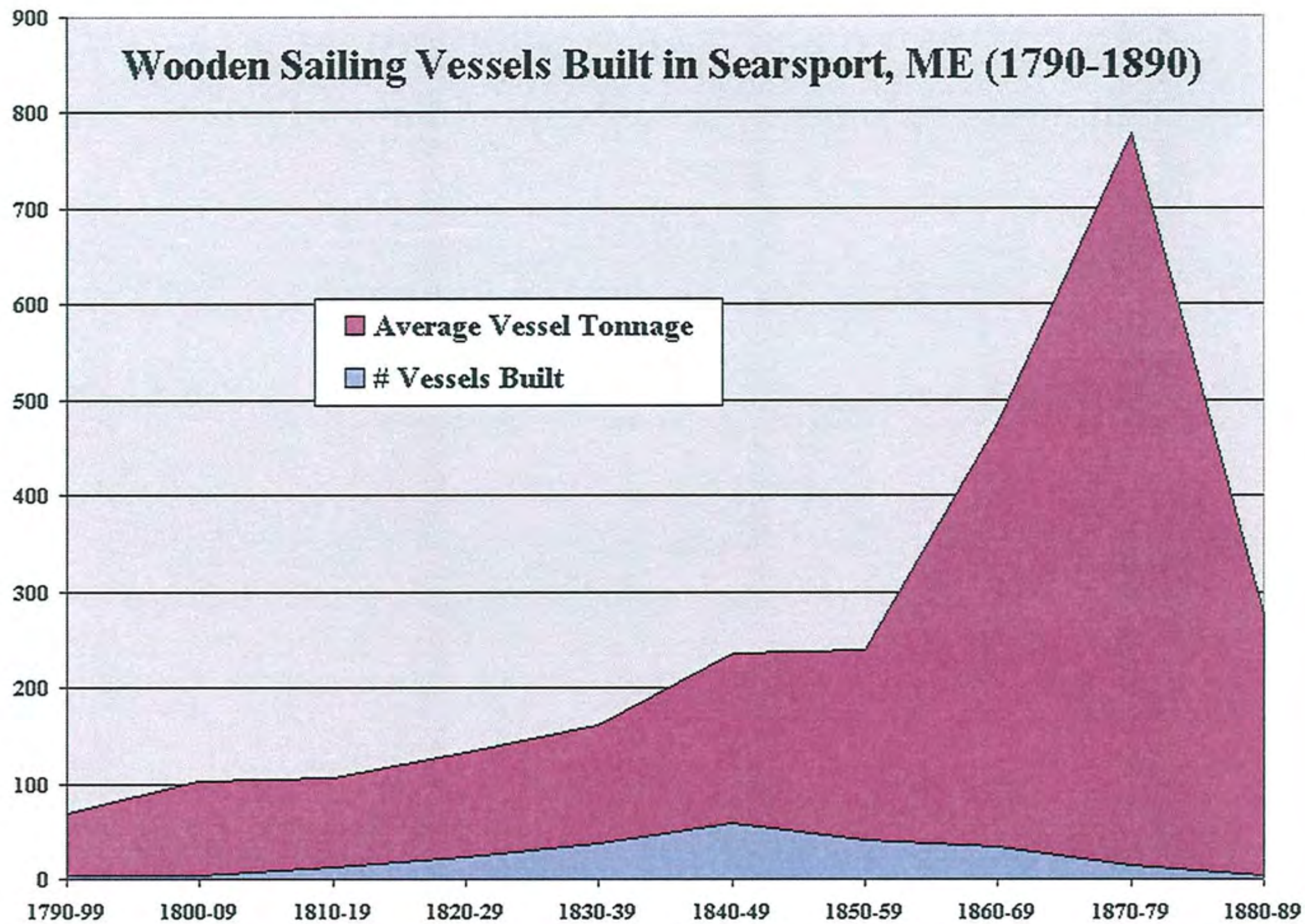

Figure 4-7. Comparison between the numbers and average tonnages of wooden sailing vessels built at Searsport (1790-1890) (based on data from Colcord 1932).

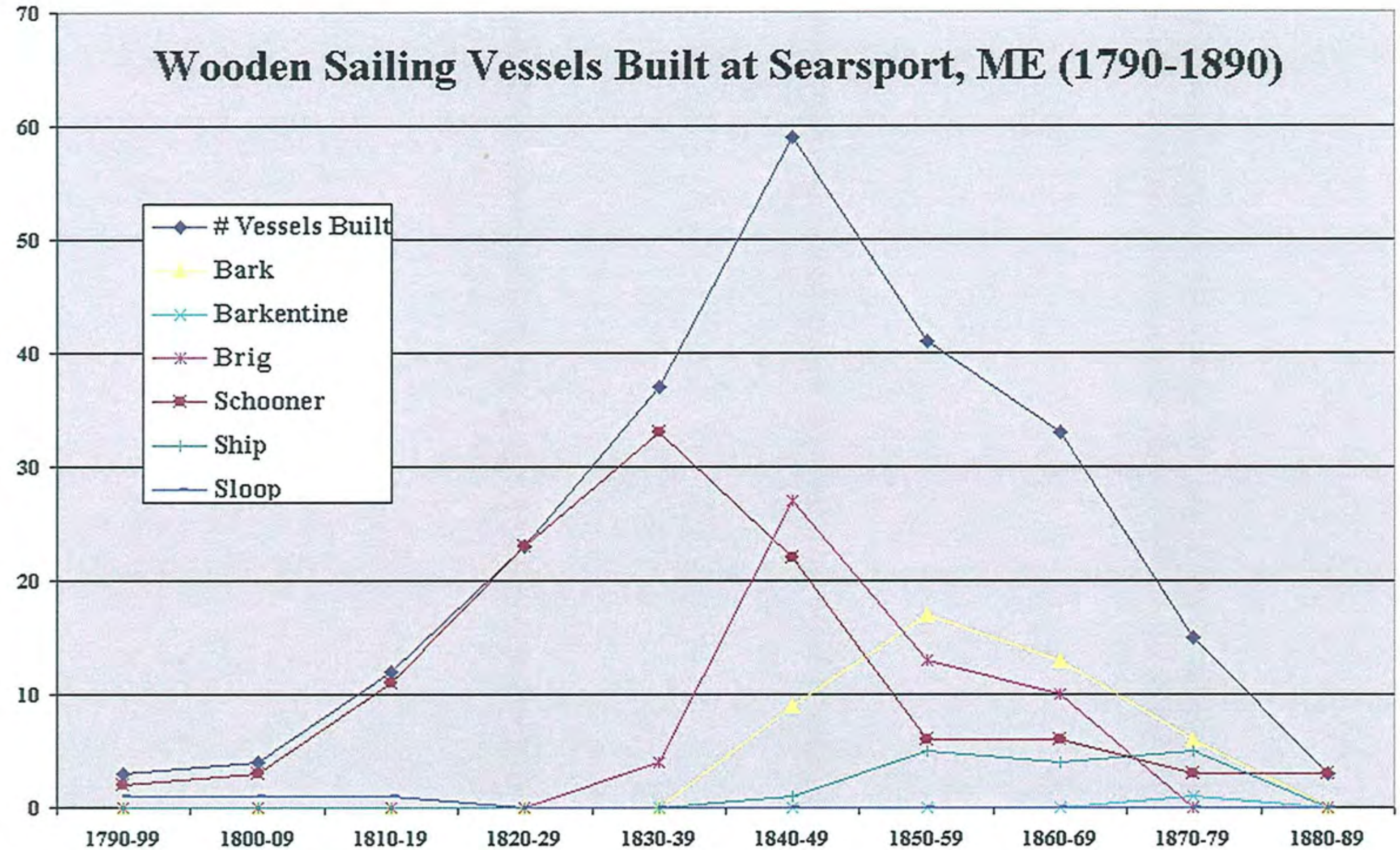

Figure 4-8. Distributions of wooden sailing vessels built at Searsport (1790-1890) by vessel rig type (based on data from Colcord 1932).

built for transoceanic trade with the Orient, East Indies and west coast;

4) 1880–1900: square-rigged barks, brigs, barkentines, and ships 300-775 tons built for transoceanic trade with the Orient, East Indies, and Europe.

From 1849 on, the number of vessels built at Searsport steadily declined, although the average tonnage of the vessels being constructed increased dramatically. Barks, barkentines, brigs, schooners, ships, and sloops were all built at Searsport, with schooners comprising the overall majority, followed by brigs and barks. Brigs and barks replace the schooner as the more commonly constructed vessel types from 1840 onward. The difference between these vessel types is primarily a function of their sailing rig, although hull shape would also be a consideration related to rig design. Schooners and sloops are fore-and-aft rigs with triangular sails that, unless modified, are best suited for beating into the wind on local or regional coastal trade routes. For longer voyages, larger vessels with square rigs, such as a brig or a bark are more efficient and therefore desirable. The dramatic increase in average tonnage during the 1860s and 1870s, accompanied by a continued gradual downturn in the number of vessels built at Searsport reflects a trend toward building larger ships in a handful of towns, such as New York and Boston, whose deep water ports were better suited for constructing larger vessels than were Searsport's shallow waters. The largest and last full-rigged ship built at Searsport was the 1,496-ton *William H. Corner,* launched in 1877 (Figure 4-9) (Searsport Celebration Committee 1970).

Searsport's demographic growth between the years 1850 and 2000, reached its initial historic peak in 1860 (Figure 4-10), which is consistent with the rise in prominence of Searsport's shipbuilding industries. Most of America's shipyards were in the Northeast, primarily in Massachusetts and Maine, and shipbuilding was concentrated more tightly there between the War of 1812 and the Civil War. Maine's forests supplied most of the wood used in New England, and the state's builders produced the most ships, although Massachusetts and New York produced a majority of the largest vessels.

Maine dominated the small freighter building business, because wood in the sizes needed could still be cut close to the yard, and the yard's labor force was composed of subsistence farmers who were willing to work for lower wages than their counterparts elsewhere. As a result, Maine-built vessels were less expensive ($5–15 per ton) than those of other yards in the U.S. (Bauer 1988:94).

As it turned out, this boom was the last hurrah for American sail. Increased domestic manufacturing lessened the need for overseas imports. The ships also began aging, and required more money to be properly maintained. There was a glut of sail in the late 1850s, and ship-owners were eager to make money any way they could. Too many ships had been built, and changing times quickly conspired against them. California's markets became saturated — shipping rates fell from $25 per ton in the early 1850s, to $11 during the Economic Panic of 1857. Maine's shipyards (including those in Searsport) did well into the 1850s, but when prices even on smaller freighters fell to well below cost after the California clipper ship demand bubble burst, many of the smaller yards were forced out of business. Speeding up the decline of the

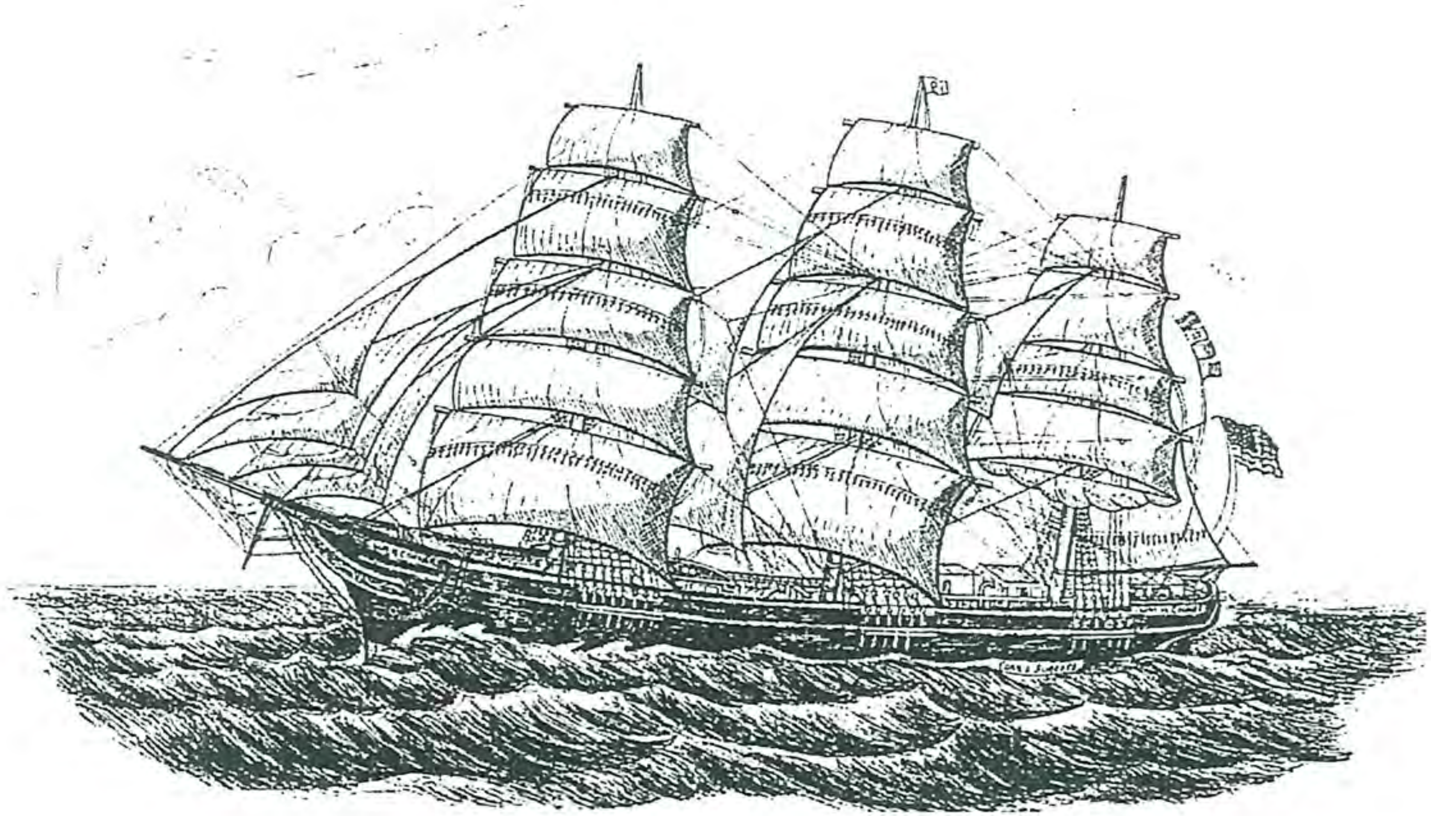

Figure 4-9. The largest and last fully-rigged wooden sailing ship built at Searsport – the 1,496-ton *William H. Corner* (1877) (Searsport Celebration Committee 1970).

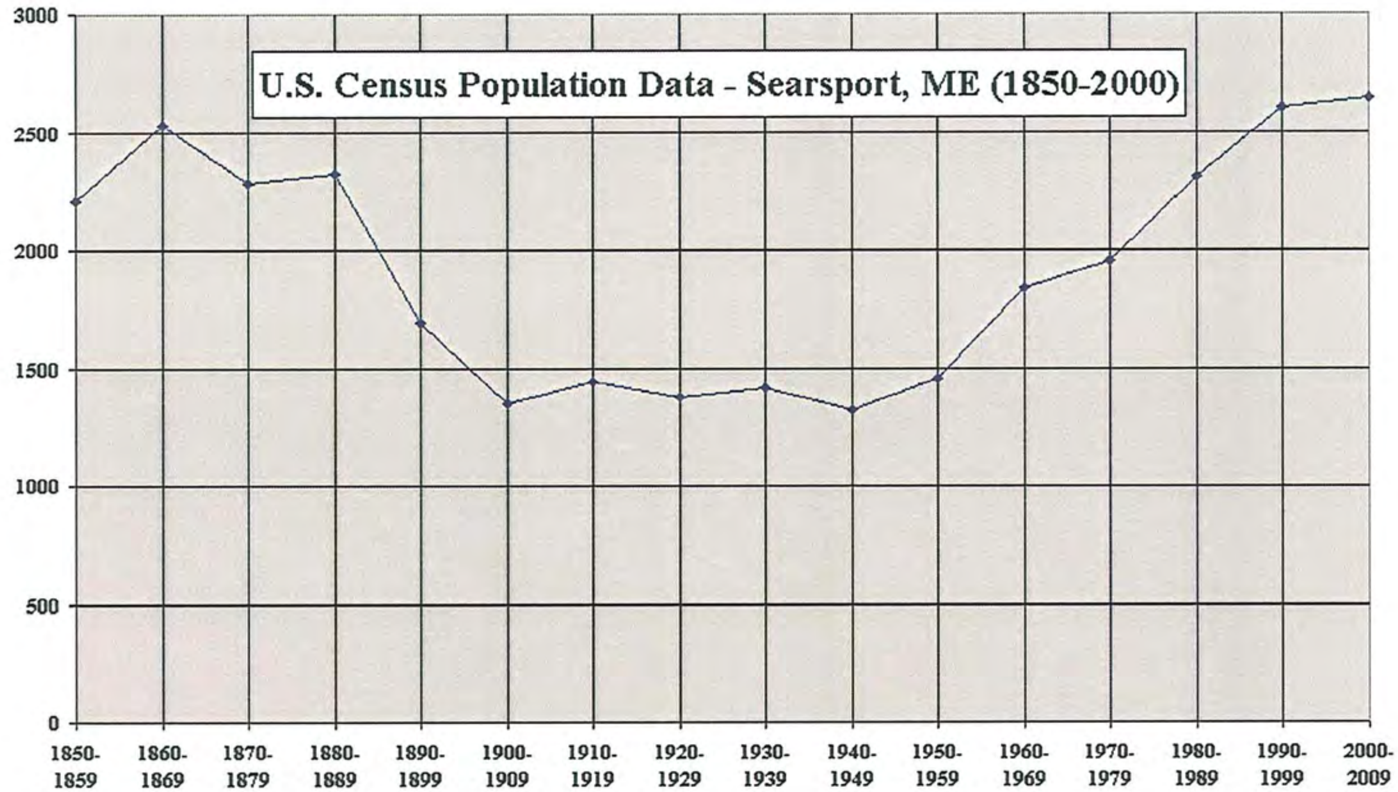

Figure 4-10. Distribution of U.S. Census population figures for Searsport (1850-2000).

wooden shipbuilding industry was the introduction of steam ships of iron, and, later, steel, made both overseas (England) and in the larger shipyards of Bath, Portland, Boston, and New York, which proved more efficient and dependable and eventually drove Maine's wooden sailing ships from the waters (Allin 1995:307; Hayward 1839). In fact, it was a steamboat, *Amadis*, that was the last vessel built at Searsport (1894) (Searsport Celebration Committee 1970).

As the shipbuilding and lumbering industries declined, farming and fishing rose in economic importance. In 1873, a large number of weirs and pound nets were being fished at the head of Penobscot Bay (Figures 4-11 and 4-12). In Searsport, adjacent to the project study area, there were six weirs on the west side of Sears Island and two more located at Mack Point (Spiess and Hedden 1983:16). Construction and operation of Maine's commercial fishweirs, including at Searsport, is described in Johnson (1942:197–207). Reconstructed each year, Searsport's fishweirs were made out of cut wooden stakes and brush usually with one long straight leader extending from shore and running to one or two circular pockets that collected fish (Figure 4-13). Weirs for herring, mackerel, and salmon were relatively lightly constructed, while weirs intended for catching alewives were more solidly joined pile and lathe bottoms with nets on top, and had fish storage pounds that were harvested using a purse seine operated from one or two dories. The modern weirs were built and operated by just a single owner and several employees. It is likely that Native Americans operated similar weirs at Sears Island during the pre-contact period.

After a 50-year period of flat growth during the first half of the twentieth century, U.S. Census figures show Searsport's population has grown steadily to a present (Y2000) all-time high of 2,641 people. This growth is associated in part with the development of the Searsport and Mack Point waterfront into one of the region's most important international shipping terminals (Figure 4-14). This development was initiated in 1903 with the purchase of shorefront land east of Route 1 in Searsport and Stockton by the Bangor and Aroostook (B&A) Railroad (Andrews 1965:2, 3). In 1905, a charter was granted to the B&A Railroad to extend its line from LaGrange to Searsport (Andrews 1965:2). The addition of this rail line led the Penobscot Coal and Wharf Company to establish one of the largest and best equipped coal packets and dock facilities east of New York City from which a quarter of a million tons of coal was shipped annually (Figure 4-15). Over the next several decades shipping services at the industrial waterfront terminal at Mack Point were expanded to also include large chemical and fertilizer processing plants, petroleum storage tanks and their associated piers, and a truck terminal (Andrews 1965:3, 4). Searsport's connection to the sea remains as vitally important today as it was 150 years ago, because of the port's active service as the easternmost, international, year-round, deep-water port in the United States (Figure 4-16) (Searsport Port Committee n.d.).

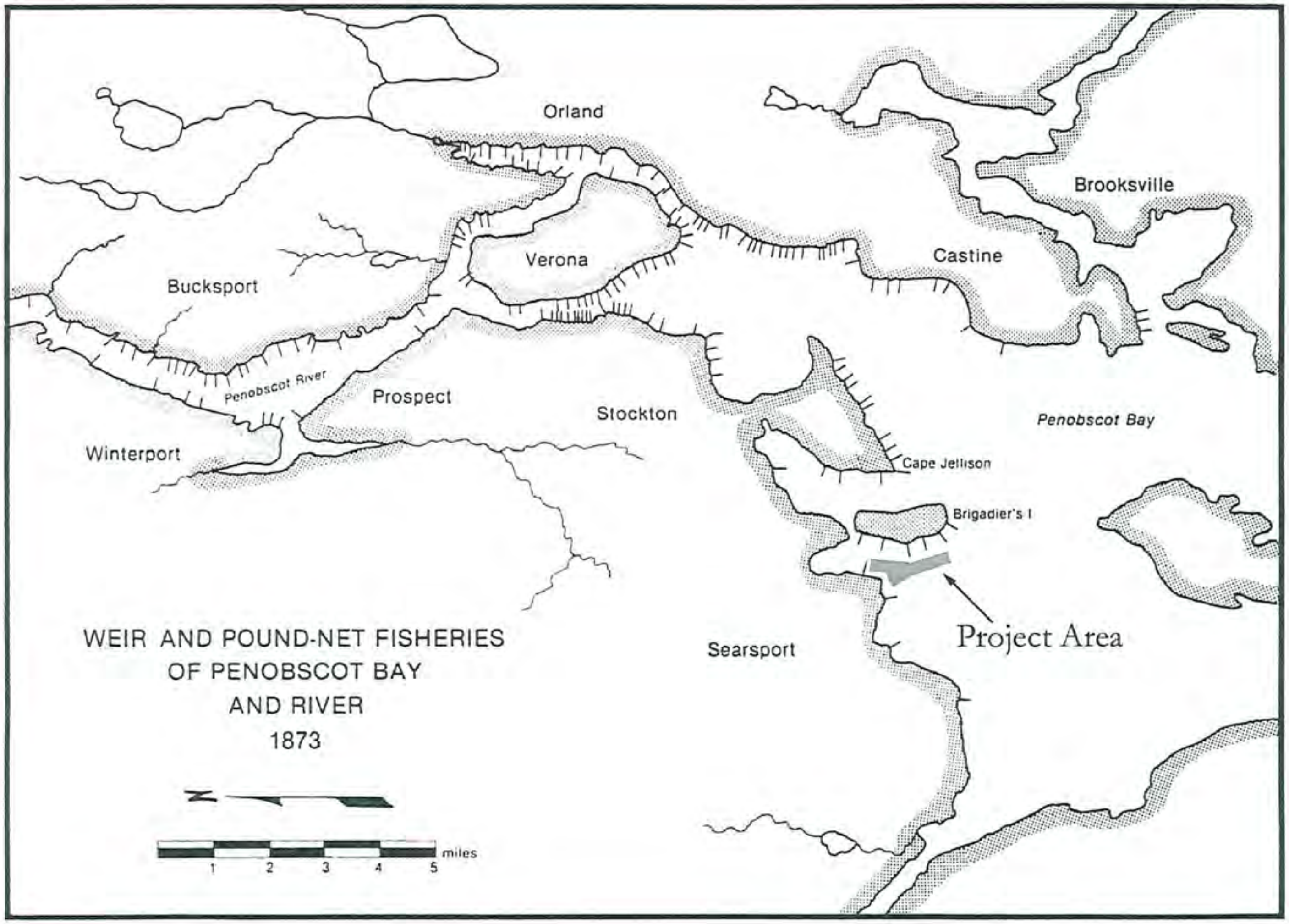

Figure 4-11. Locations of fishing weirs and pound nets in the Penobscot River and Bay in 1873 (after Spiess and Hedden 1983:)

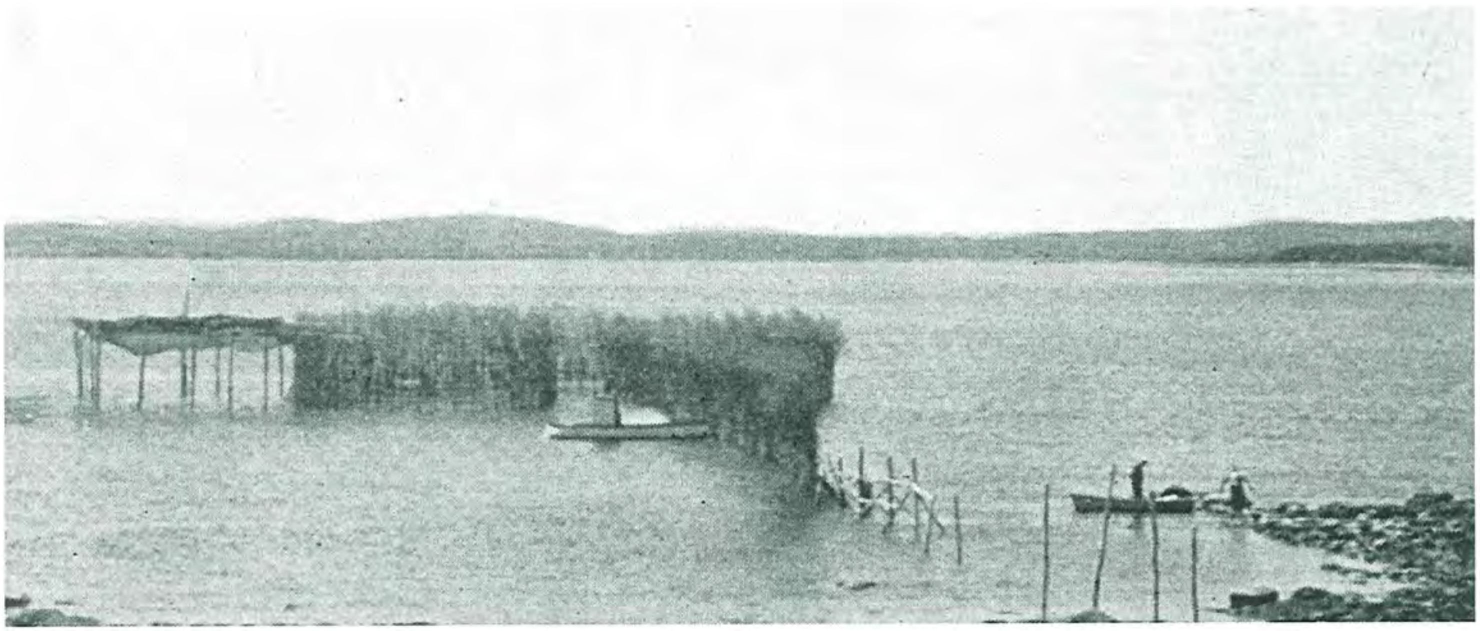

Figure 4-12. Post-contact period fish weir in Searsport (Johnson 1942:205).

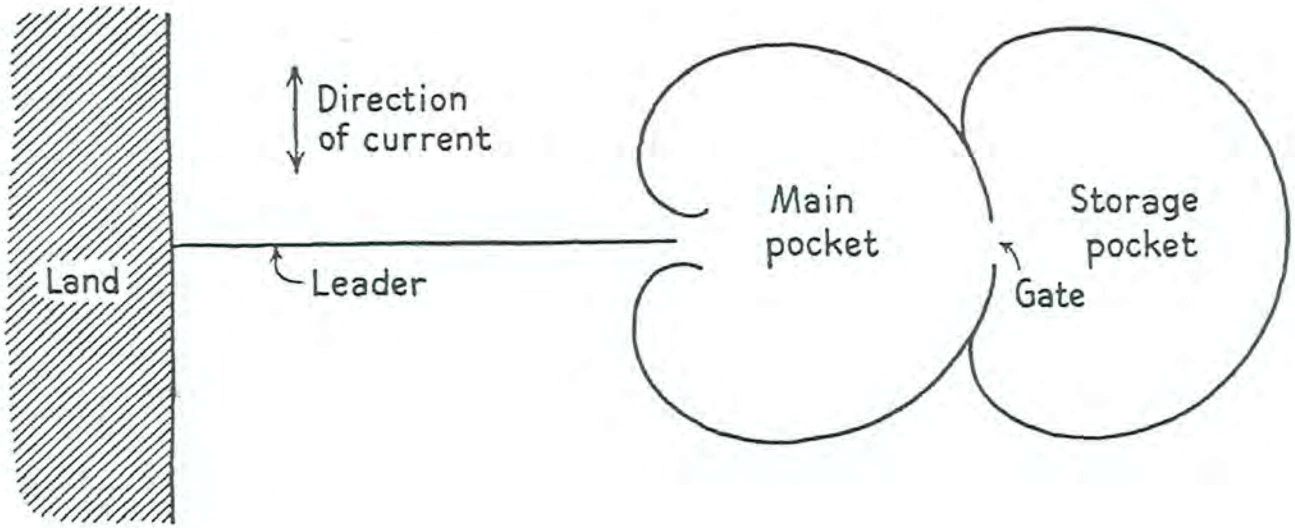

Figure 4-13. Configuration of Searsport's post-contact period fish weirs (Johnson 1942:198)

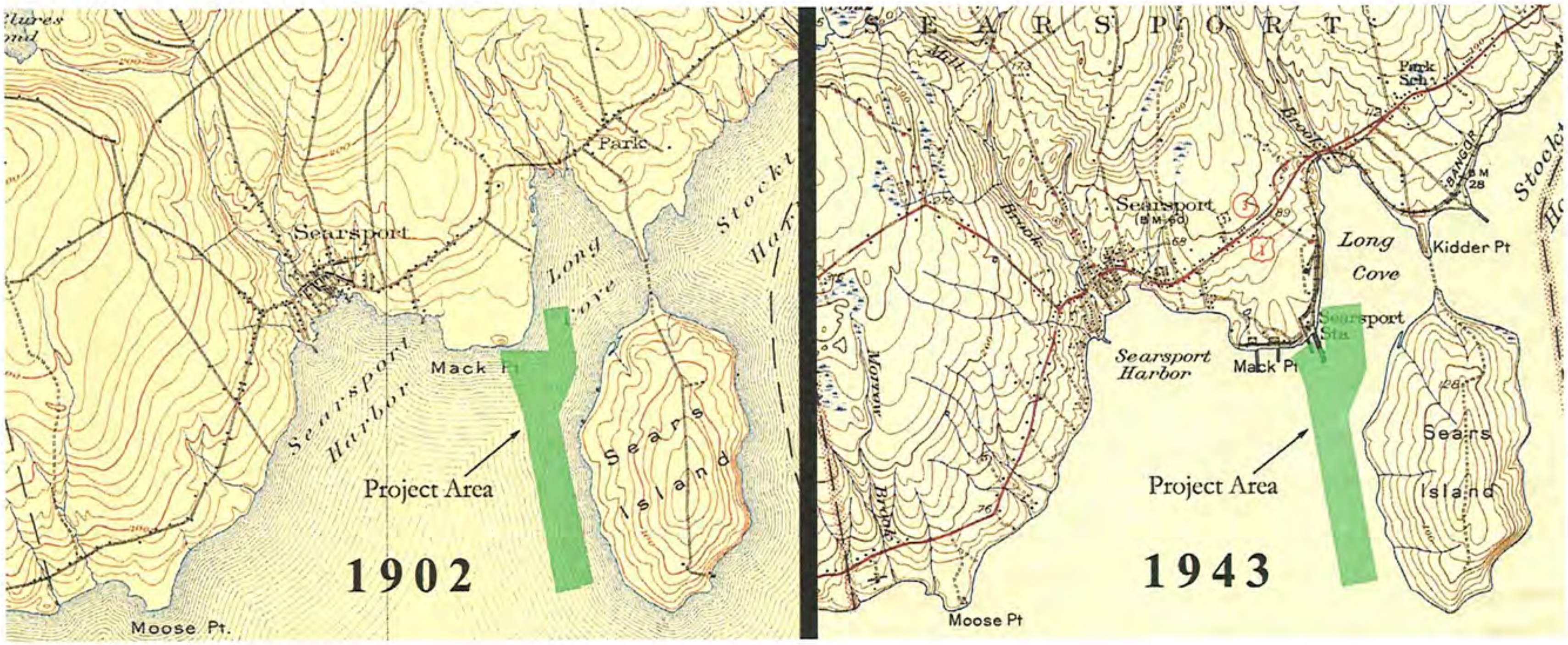

Figure 4-14. Excerpts of 1902 and 1943 USGS Castine, ME 15-minute series quadrangle maps showing Searsport Harbor and Mack Point prior to and after the harbor extension of the Bangor and Aroostook Railroad and development of the area into a major shipping terminal.

Marine Archaeological Survey, Searsport Harbor, May 2007

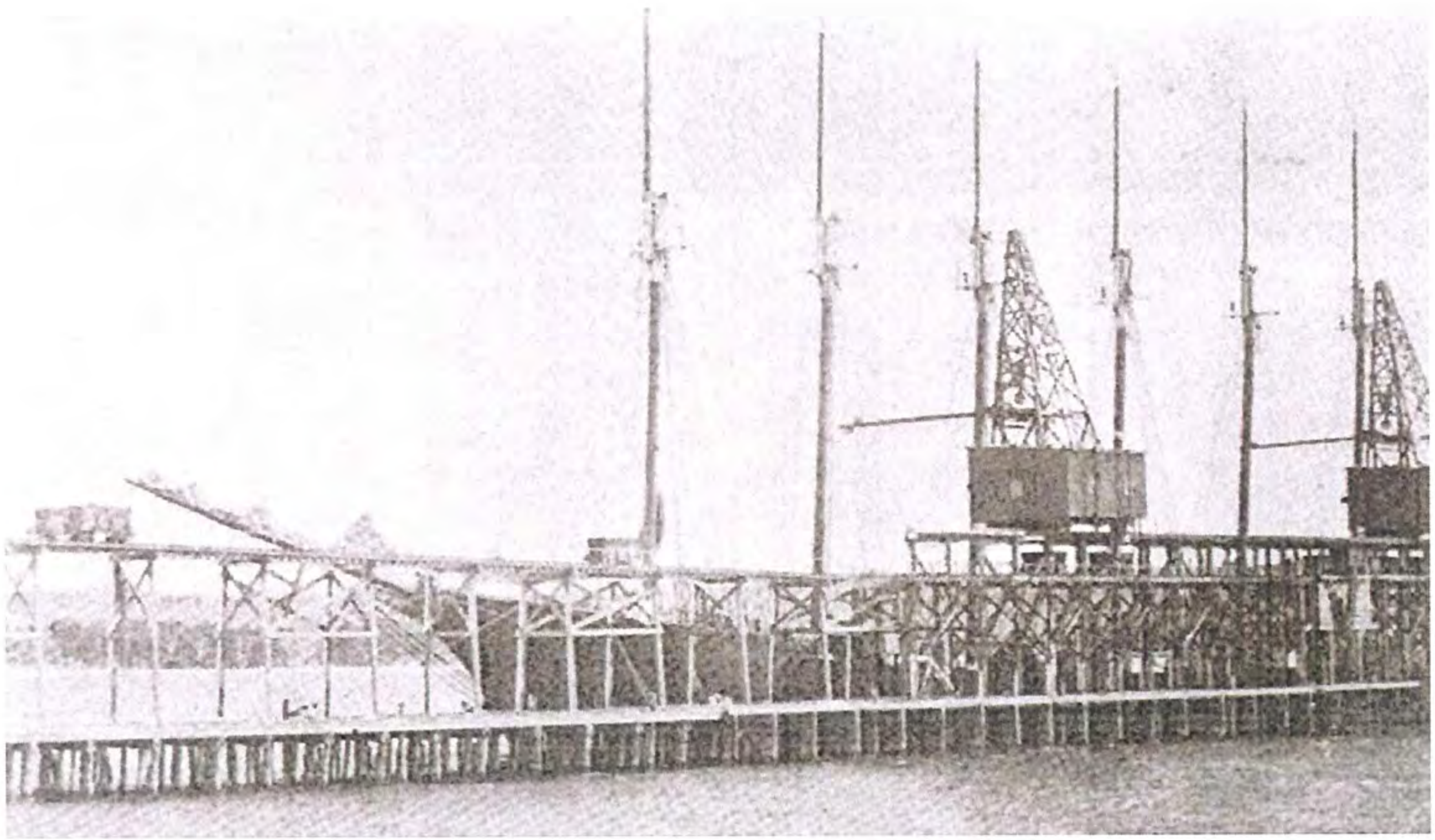

Figure 4-15. Penobscot Coal and Wharf Company dock at Searsport (Searsport Celebration Committee 1970).

Figure 4-16. International deep water ships, including the Cypriot vessel, *Moskalvo*, arriving, departing, and transferring cargo at the Mack Point terminal in Searsport in 2006.

CHAPTER FIVE

RESULTS AND RECOMMENDATIONS

Archival research conducted for this investigation recorded data useful for predicting the locations and types of pre- through post-contact period underwater archaeological deposits possibly present in the Searsport Harbor project area. The field investigations conducted for this study produced geophysical (i.e., remote sensing) data that was used to assess the area's geology and potential hazards to the proposed Searsport Harbor navigation improvements project and identify and inventory anomalous targets with the potential to be shipwrecks or areas of potential paleosols with archaeological sensitivity. This chapter presents the results of these research and field survey tasks, and provides recommendations regarding the need for additional archaeological investigation.

Archival Research Results

Archaeological Sensitivity for Submerged Pre-Contact Archaeological Deposits

The Searsport Harbor project study area's location is in a resource-rich, protected coastal setting on the northwestern shore of the head of Penobscot Bay. Penobscot Bay is the drowned southern end of the Penobscot River valley, which was inundated by rising sea level and coastal subsidence. Together, the river and embayment form Maine's largest estuary and would have been a particularly attractive area for settlement during the pre-contact period.

Review of the available archaeological literature for the Penobscot Bay area indicates that the state's central coastline contains the oldest known coastal pre-contact archaeological sites in Maine, and more sites older than 4000 B.P. than any other coastal section of the state (Sanger and Kellogg 1989:120). There is ample evidence within the central coast of Maine of a nearly 5,000-year continuum of human habitation, extending from ca. 5290 B.P. through the contact period (ca. 450 B.P.). This continuum exhibits a dual marine-terrestrial exploitation pattern consisting of habitation sites that are all located on or very near to the present shoreline (Sanger and Kellogg 1989:119–120; Spiess and Hedden 1983).

The earliest and richest known surviving record of human occupation in Penobscot Bay derives from the important Turner Farm Site on New Haven Island in the lower bay (approximately 15 miles [30 km] south of the Searsport Harbor study), discussed in the previous chapter. As noted, the Turner Farm Site occupations extend from the start of the Late Archaic to the early contact period, and have been studied and described in detail by Bourque (1976), and Spiess and Lewis (2001). Based on the research conducted to date at the Turner Farm Site, subsistence activities of the lower Penobscot Bay's inhabitants ca. 5000 B.P. appear to have had a strong maritime focus, with codfishing, swordfishing, and deer hunting commonly pursued tasks. By the time of European contact, inhabitants of the same area were more focused on hunting moose and deer, although they also hunted seals and sea birds, fished for flounder and sturgeon, and collected clams (Spiess and Hedden 1983:5).

Marine resources available to inhabitants of the upper Penobscot Bay during the last 1,000 years included soft shell clams, mussels, gray and harbor seals, ducks, geese, cormorants, great auks and other alcids, other sea birds, anadromous fish, and inshore fish (e.g., flounder, sturgeon, and cod) (Spiess and Hedden 1983:5).

Although the location of the Searsport Harbor project area fits the prevailing predictive model as an area that would have been highly attractive for pre-contact land use from the Archaic through contact periods, no National Register or National Register-eligible archaeological properties, or Maine site survey file archaeological sites, are recorded in Searsport Harbor or the project's underwater study area. This absence is probably more attributable to the negligible amount of underwater archaeological research on the pre-contact period that has been conducted to date in Maine and throughout the Northeast, rather than a conclusive indicator of the potential for such sites to exist.

In fact, pre-contact archaeological deposits are known to exist in submerged contexts elsewhere off the coast of Maine (Crock et al. 1993). Submerged finds made fortuitously by scallop fishermen dragging the seabed at depths of more than 140 ft (42.6 m) suggest even earlier aboriginal occupation of inundated former coastlines on the Continental Shelf at or near the low stand sea levels of the early Holocene epoch ca. 10,000 years ago (Crock et al. 1993:189). These finds include:

- several distinctive bifacial chipped-stone tools and a perforated stone plummet recovered in eastern Blue Hill Bay (Crock et al. 1993);
- slate ulus and a large side-notched bifacial chipped-stone tool recovered from the Bay of Fundy (Sanger 1988:86), and;
- a number of chipped-stone tools, a plummet, and a ground slate ulu from Penobscot Bay (Cox 1991; Spiess et al. 1983).

Given that no extensive effort similar to the archaeological research campaigns that have been conducted on land has been made yet in the waters of Maine to survey for submerged settlements, it is impossible to know whether additional and/or older archaeological deposits may be present underwater beneath the Searsport Harbor project area's sediments.

The documented pre-contact coastal sites that are situated closest to the Searsport Harbor study area are the Kidder Point (41.40) and Sears Island sites (41.43 and 41.44), identified and tested initially by archaeologist Bruce Bourque in 1975, and again in 1982 by Arthur Spiess and Mark Hedden (Spiess and Hedden 1983:1).

The Kidder Point Site (41.40) lies on the east facing shore of Kidder Point approximately 3 to 8 ft (1 to 2.5 m) above sea level, and consists of a single pre-contact period (i.e., early Ceramic Period [ca. 2700 to 2300 B.P.]) component occupied seasonally for a relatively brief period (1–3 years). The earliest radiocarbon date for the site is 2600 ± 110 B.P. The site was detectable in four different areas when excavated by Spiess and Hedden (Spiess and Hedden 1983:21, 181). Together, these four areas contained shell middens (composed primarily of soft shelled clam [*Mya arenaria*]), cobble hearths, chipped- and ground-stone tools, pseudo scallop shell- and dentate-rocker stamped ceramics, and bone. Analysis of the site's faunal remains indicates its occupants subsisted primarily on a diet of deer, moose, and the meat of soft shelled clams (Spiess and Hedden 1983:161).

The two documented pre-contact sites on Sears Island (41.43 and 41.44) are situated on the eastern shore of the northern tip of Sears Island between the 1982 shoreline and lie about 3 ft (1 m) above sea level. Archaeological evidence indicates that both sites have components that are earlier in date than the Kidder Site.

Site 41.43 is a multicomponent Native American shell midden site consisting of four different cultural occupational deposits dating from the Late Archaic through contact periods (ca. 3700 to 400 B.P.). The earliest component is associated with the Susquehanna tradition, as evidenced by broken felsite bifaces that are formally very similar to those from Occupation III of the Turner Farm Site. The two Ceramic Period components consist of one component that contains pseudo scallop shell- and dentate-rocker stamped ceramics dating from ca. 2300 to 1200 B.P., and a second component that contains cord-wrapped, stick-impressed ceramics dating from ca. 1200 to 600 B.P. The contact period component is composed of seventeenth-century items of European manufacture (e.g., a trade bead, white clay pipe stems, a gun flint, a hand-wrought nail, and a thin piece of sheet-copper formed into the face of a cat). It's interesting that, although there appears to be a continuum of Ceramic Period components, no Vinette I ceramics associated with the transition between the Late Archaic and Early Ceramic periods were found to be present at Sears Island Site 41.43. Analysis of the faunal remains at Sears Island Site 41.43 indicates a subsistence pattern that is slightly different from that found at the Kidder Point Site. Moose, deer, and beaver remains dominate the faunal assemblage, as they do in the Kidder Point assemblage, but the remains of sturgeon, cod, sculpin and flounder were also present, suggesting that there is a culturally significant difference between Sites 41.43 and 41.40.

Sears Island Site 41.44 is an eroded shell midden first visited by Spiess in 1978. In 1982, evidence of the midden (i.e., the remains of soft shelled clam shells) was gone, having eroded away and leaving behind only a scatter of rolled lithic flakes and small assemblage of widely scattered lithic beach finds comprised primarily of tools and debitage of felsite (like at Sites 41.40 and 41.43). One of the lithic artifacts, a stemmed biface, provides some indication of the date of Site 41.44. If the stem of the biface is unfinished (i.e., unthinned), it would fit in a ca. 4500 B.P. Moorehead Phase assemblage, such as that found in Occupation II at the Turner Farm Ssite. If, however, the stem was finished, then the biface would fit the circa 3700–3400 B.P. contracting stem assemblage of the Susquehanna tradition, a significant component of the Sears Island 41.43 site.

The greatest volume of pre-contact period cultural material on all three sites dates from the early Ceramic Period and was produced by makers of pseudo-scallop shell and dentate-rocker stamped ceramics (Spiess and Hedden 1983:181). Kidder Point and Sears Island sites are somewhat anomalous in that they did not contain evidence of "mass capture" fishing techniques as Spiess and Hedden anticipated they would at the beginning of their study, based on the sites' locations and the area's intensive post-contact period weir fishery. It is interesting that none of the Kidder Point or Sears Island sites contained components that conclusively predate ca. 3600 B.P. However, as Spiess and Hedden (1983:181) and Bourque (2001:39, 41) point out, the older (i.e., PaleoIndian and Early Archaic) near-shore occupations are more likely to have been submerged and destroyed by erosion caused by sea level rise.

Although this hypothesis may be an acceptable explanation for the absence of older sites on the Bay's present shoreline, where erosion has been the greatest because sea level rise has been relatively slow since ca. 5000 B.P., it fails to consider the possibility for sites located in bathymetric lows on the flanks of paleochannels to be preserved in areas offshore, where they may have been drowned in place by a rapid step-wise retreat of the landward migration of the paleoshoreline before being buried under and preserved by protective layers of marine sediments (Figure 5-1). While none of the sites closest to the Searsport Harbor project study area are demonstrably older than 3600 B.P., the potential for earlier sites to be present is suggested by the concentration of Maine's earliest coastal sites in the Penobscot Bay area (e.g., the nearby Turner Farm Site's Occupation) and the submerged finds of early period lithics by fishermen in nearby eastern Blue Hill Bay (Crock et al. 1993; Sanger and Kellogg 1989:120; Spiess and Lewis 2001). Such deposits indicate a strong connection between Native populations and the region's resource-rich waters and shorelines beginning as early as about 7,000 years ago (Bourque 2001:XVI, 3).

Based on current estimates of local sea level rise and the inundation of Penobscot Bay, any pre-contact archaeological deposits potentially preserved within the Searsport Harbor project study area could be culturally and temporally affiliated with the Fluted Point PaleoIndian tradition through the first millennium of the Ceramic Period (circa 11,500 to 2500 B.P.).

For stratified archaeological deposits preserved in meaningful contexts to exist within the Searsport Harbor study area, intact elements of the paleo-landsurface in which they were deposited that survived the postglacial marine transgression and subsequent impacts from modern marine processes and human activities need to be present. Evidence of such paleosol deposits in the Northeast has thus far proven rare. The relatively rapid inundation of the Maine coast, combined with the depositional sedimentary environment of the Nearshore Basins region and relatively protected nature of the project area's location within Searsport Harbor, suggests archaeologically sensitive paleosols could be present within the Searsport project area. If present, they are likely to be deeply buried under Holocene muds and sands.

Preservation of any inundated pre-contact archaeological deposits that potentially exist in the Searsport Harbor study area is dependent upon the depth of their burial relative to the erosional scouring from subsequent post-inundation wave and tidal current regimes, human impacts on sediments resulting from commercial fishing and/or navigation channel development/maintenance activities. Based on contemporary modeling of pre-contact

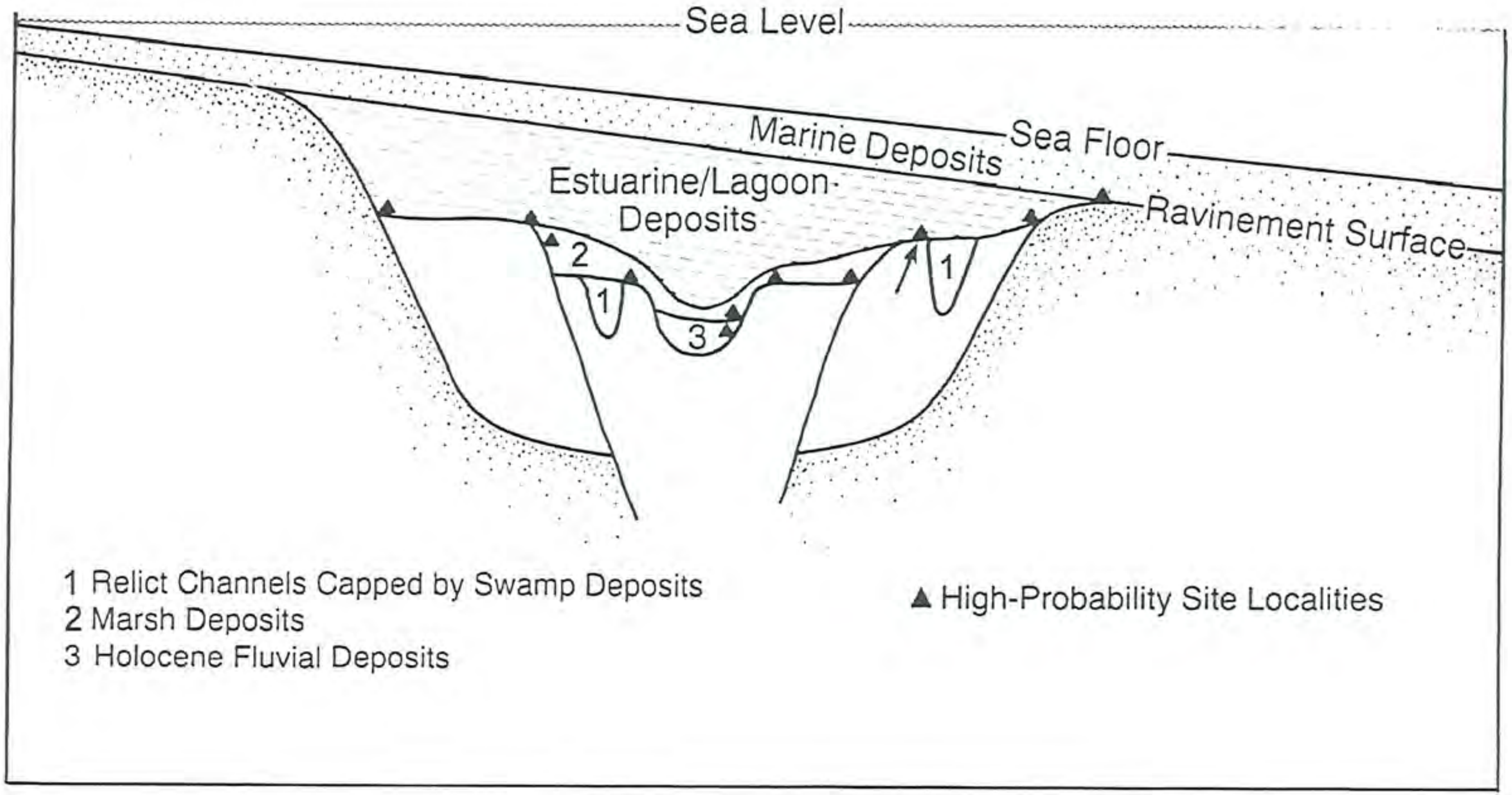

Figure 5-1. Generalized cross-section showing the most likely location for the preservation of pre-contact archaeological deposits under the ravinement surface along the flanks of river channels that became entrenched on the inner Continental Shelf during sea level low stands (source: after Waters 1992:279).

archaeological site locations in coastal Maine, and in northern coastal environments elsewhere in the world, the strong correlation between nearby water and site presence, and the erosional effects of the harbor's wind-generated waves and tidal currents, the Searsport Harbor study area is considered to possess moderate potential for containing formerly terrestrial archaeological deposits dating from ca. 11,500 to 2500 B.P. Any pre-contact Native American archaeological deposits present in the Searsport Harbor project area, such as those associated with the nearby coastal sites described above, would likely be of a maritime nature (i.e., watercraft or fishing weirs).

Archaeological Sensitivity for Contact/Post-Contact Submerged Archaeological Deposits

Available information for the Searsport area's contact/post-contact period history (i.e., review of National and State registers of archaeological properties; queries of NOAA's AWOIS and the NSDB; archival research of special collections; review of previous CRM investigations and secondary sources; and local informant interviews) documents an extensive 400-year history of native and non-native fishing, shipbuilding, and maritime commerce in and around Penobscot Bay and Searsport Harbor. As noted above, the town of Searsport reached its commercial zenith during the mid-nineteenth century, as Maine became the "foremost builder of wooden ships in the country" (Allin 1995). Between 1792 and 1892, Searsport had been home to 286 vessel masters and eight different shipyards at the height of the town's wooden shipbuilding era (1840s–1850s). Together, Searsport shipyards produced 232 vessels between 1792 and 1892 (Colcord 1932).

Despite Searsport and the upper Penobscot's histories of comparatively intense maritime activity, shipwreck database research conducted for this study produced only three documented vessel casualties within all of Searsport Harbor (Table 5-1). Only one of these casualties is the charted shipwreck located within the southwestern end of the project study area.

Recognizing the region's extremely long history of maritime activity (exploration, naval combat, commercial shipping, fishing, etc.) and that most vessel casualties went unrecorded, as well as the relatively protected nature of the project study area, the Searsport Harbor project study area has a moderate archaeological sensitivity for containing sunken contact/post-contact period vessels and/or coastal structures.

Field Survey Results

Geophysical survey performed by OSI and PAL provided side-scan sonar, magnetometer, and sub-bottom profiles for the Searsport Harbor project study area. These data were reviewed in the field as they were recorded as well as after the data was post-processed to identify and inventory areas with potential to be archaeologically sensitive paleosols or targets likely to be associated

Table 5-1. Reported Vessel Casualties in Searsport Harbor

Casualty Date	Vessel Name	Type	Dimensions (L-x-W-x-D)	Date/Place Built	Reported Location	Reported Cause	Cargo	Comments	Data Source(s)
9/19/1889	*Brunette*	schooner	78-x-25-x-7 ft 81-85 tons	1871 Searsport, ME	Searsport Harbor	aground	4,500 bshls corn	grounded in a gale "a few feet off" wharf; "in a bad position"; "started keel and filled, damaging the vessel and cargo extensively"; cargo insured; corn sold to farmers at a discount; vessel presumed to be salvaged	*Belfast Age* (Sept. 26, 1889) Berman (1972:15) BUAR/Paul Sherman Shipwreck Collection Fish (1989:226) Northern Shipwrecks Database (2002) *Republican Journal* (Sept. 26, 1889) Warren Riess, Pers. Comm. (2007)
5/28/1938	*Cullen No. 18*	schooner-barge	189-x-34-x-18 ft 923 tons (1,500 tons?*)	1900 Bath, ME	Searsport Harbor	explosion in donkey engine boiler room, fire & sank	none - had just offloaded coal cargo	480 yds off Penobscot Coal Co. dock	Berman (1972:23) BUAR/Paul Sherman Shipwreck Collection Fish (1989:276) Northern Shipwrecks Database (2002) *Republican Journal** (June 2, 1938) Warren Riess, Pers. Comm. (2007)
8/31/1954	*B.C. No. 2890*	scow or barge	109-x-30-x-7 ft 195 tons	1944 Quincy, MA	Searsport Harbor	foundered	n/a	wood vessel	Berman (1972:11) BUAR/Paul Sherman Shipwreck Collection Fish (1989:287) Northern Shipwrecks Database (2002) Warren Riess, Pers. Comm. (2007)

with contact/post-contact period National Register-eligible archaeological deposits (e.g., shipwrecks and coastal infrastructure). Data sets reviewed by PAL included:

- Post-plot drawings of surveyed track lines and anomalies
- All-inclusive anomaly inventories produced for the geological characterization/hazard survey
- Sub-bottom profiles of each surveyed track line
- Screen-capture images of select areas in the side-scan sonar and sub-bottom profiler data.

Analysis of the survey data documented 376 side-scan sonar anomalies (Appendix D) and 152 magnetic anomalies (Appendix E), as well as several sub-bottom profile reflectors that appear to be associated with a buried paleochannel feature (Figure 5-2, Back Pocket). A majority of the magnetic anomalies are small in amplitude, measuring 20 gammas or less. All but one of the side-scan sonar anomalies (SS 375) and four of the magnetic anomalies (M 54, -60, -62, and -132), which are associated with the charted shipwreck (Figure 5-3), are caused by lobster traps and scattered isolated debris that are typical for most commercial harbors in the Northeast. Not surprisingly, the concentration of debris is focused at the northern end of the project study area, closest to where the currently utilized commercial piers at Mack Point are located. A detailed description of the field survey's geological results is provided in the project's marine geophysical report prepared by PAL's sub-consultant, OSI (OSI 2007).

Pre-Contact Submerged Archaeological Deposits

The sub-bottom profiler produced a clear record of the Searsport Harbor project area's geomorphology. This record contained evidence of the four strata typically present in Maine's inshore coastal region (i.e., bedrock, till, Presumpscot Formation, and Holocene mud/sand). What appears to be the subaerially exposed upper surface of the Presumpscot Formation, interspersed with fluvial channel cut features, and truncated by the Holocene ravinement surface, as well as several distinct paleochannels, are evident in the sub-bottom profiles, particularly those recorded in the northeastern portion of the study area, near the entrance into Long Cove (Figure 5-4). Discovery of preserved elements of the Presumpscot Formation's former subaerially exposed, oxidized terrestrial land surface would be significant relative to the potential presence of pre-contact archaeological deposits, as it is this surface that would have been inhabitable to humans at the time of the lowstand in local sea level.

Contact/Post-Contact Period Submerged Archaeological Deposits

Side-scan sonar anomaly SS 375 and magnetic anomalies M 54, -60, -62, and -132 correlate with the charted position of a post-contact period shipwreck located within the project study area (see Figures 5-2 and 5-3) (Table 5-2). The wreck lies in about 40 ft (12 m) of water on a longitudinal

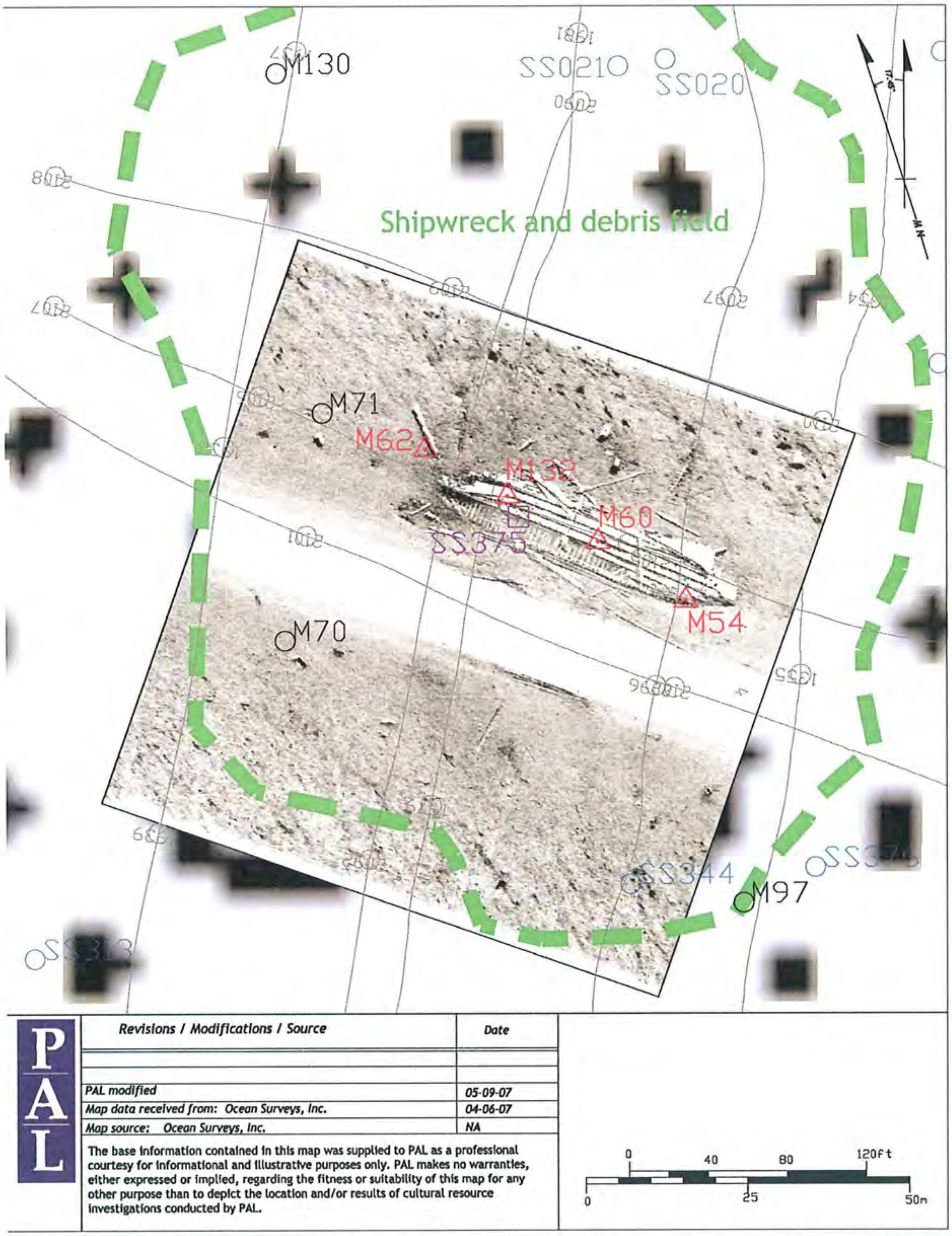

Figure 5-3. Side-scan sonar anomaly SS 375 and magnetic anomalies M 54, -60, -62, and -132 associated with the charted shipwreck located within the Searsport Harbor study area.

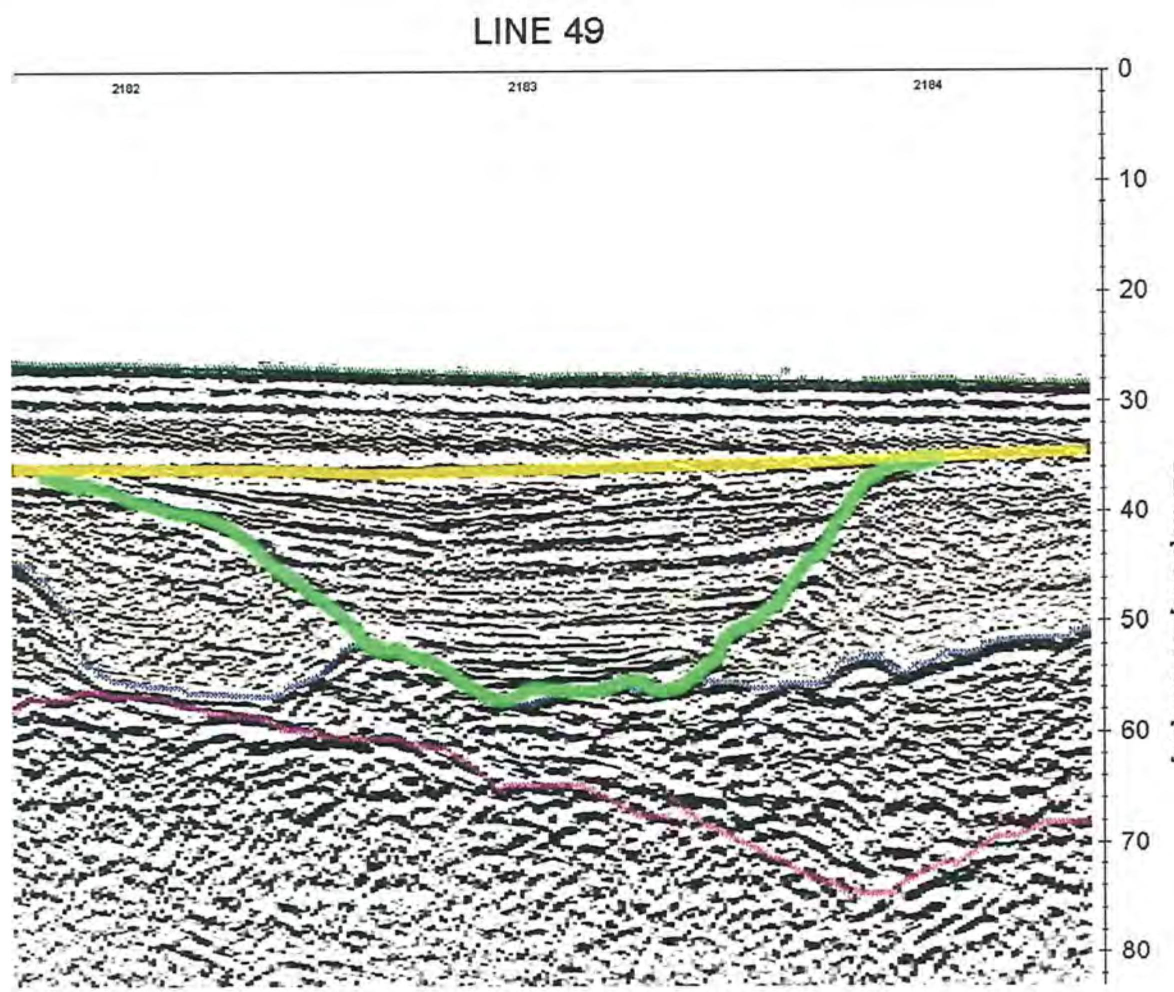

Figure 5-4. Representative sub-bottom profile from the Searsport Harbor study area showing the archaeologically sensitive paleochannel feature (green line) and ravinement surface (yellow line). The blue line demarcates the top of coarse glacial till or bedrock. The magenta line delineates the top of competent rock. Events across the top of profile are spaced apart at an approximately 200 ft (61 m) interval (image courtesy of OSI).

Marine Archaeological Survey, Searsport Harbor, May 2007

Table 5-2. Cultural Resources-Related Remote Sensing Targets

Trackline Event#	*Anomaly ID#*	*Easting*	*Northing*	*Size (gammas)*	*Type*	*Duration (feet)*	*Sensor Altitude*	*Associated Side Scan Target*	Notes
692.3	M54	879666	281506	27.3	D	100	20.49	SS375	Anomalies are associated with a shipwreck believed to be the coal-hauling schooner- barge *Cullen No. 18* (blt. 1900; lost 1938)
771.4	M60	879622	281536	89.7	D	120	22.72	SS375	
811.9	M62	879535	281584	32.8	D	40	19.2	SS375	
1979.8	M132	879576	281560	47.3	M+	80	18.36	SS375	

NOTES

1. Coordinates are in feet and utilize the Maine State Plane Coordinate System - East Zone 1801, referencing the North American Datum of 1983 (NAD 83).
2. Anomaly types: M+ = positive monopole, M- = negative monopole, D = dipole, CD = complex dipole

axis oriented northwest-to-east/southeast (285°/105° true) near the west channel slope approximately 1,100 ft (335 m) northwest of red nun buoy No. 4. Magnetic anomalies M 54, -60, -62, and -132 were recorded on four adjacent track lines oriented at a nearly normal angle to the wreck. The anomalies measure 40 to 120 ft (12 to 37 m) in duration, but are all less than 100 gammas in amplitude (i.e., 27.3, 89.7, 32.8, and 47.3 gammas, respectively). The relatively low amplitudes of these 4 anomalies indicates relatively little ferrous metal is present at the site, and correlates well with the appearance in the side-scan sonar imagery that the vessel's hull was made from wood rather than metal.

The extraordinarily high resolution acoustic images of the wreck recorded during the survey provide an excellent overall map of the site and make it possible to describe it in some detail (Figure 5-5). The acoustic target created by the ship's remains measure approximately 30-x-160 ft (9-x-49 m), with less than 5 ft (1.5 m) of relief above the bottom. It appears that the entire bottom of the ship's hull is preserved intact from bow to stern to the level of the water line. Approximately 20 displaced lower hull planks, 38 floor timbers (i.e., the lowermost lateral ribs or frames in a ship's hull), the main keelson assembly, and three fully intact and two partially intact hull stringers are all plainly visible. Also visible are numerous lobster traps and line entangled in the wreckage. There is no indication from the sonar record that cargo is present among the hull remains.

Hull structure similar to that of *Cullen No. 18*'s submerged remains (i.e., hull planking, keelson, longitudinal stringers, frames, etc.) is visible in the beached wreck of another contemporary schooner-barge, the *Pine Forest*, lost in a storm on Cape Cod January 10, 1911 (Figure 5-6) (Morris:1984:83). Similarities between the side-scan sonar image of the wreck of the schooner-barge, *Cullen No. 18*, and the photograph of the wreck of the *Pine Forest* confirms that only the bottom of *Cullen No. 18* hull is preserved intact.

Results from the archival research conducted for this project combined with those from the field survey made it possible to identify the wreck as the 923-ton, 189-x-34-x-18 ft (58-x-10-x-5 m) coal-carrying schooner-barge, *Cullen No. 18*, built in Bath, Maine in 1900, and lost to a donkey boiler room explosion and fire 69 years ago on May 28, 1938 (BUAR - Paul Sherman Shipwreck Collection n.d.; *The Republican Journal* June 2, 1938). A description of the disaster appeared in the front page headlines of the June 2, 1938 Belfast-based newspaper, *The Republican Journal* (Figure 5-7). Review of archival records and contemporary newspaper accounts associated with the other two potential wreck candidates, the late-nineteenth-century schooner, *Brunette*, and the mid-twentieth-century scow, *B.C. No. 2890*, made it possible to eliminate them from further consideration. Neither vessel has dimensions as big as the hull remains recorded by the side-scan sonar, and the newspaper accounts of the *Brunette*'s loss indicate that it ran aground in a gale very close to the wharf it was attempting to reach, rather than sinking out in the middle of the Harbor (Figure 5-8) (*The Belfast Age* Sept. 26, 1889; *The Republican Journal* Sept. 26, 1889).

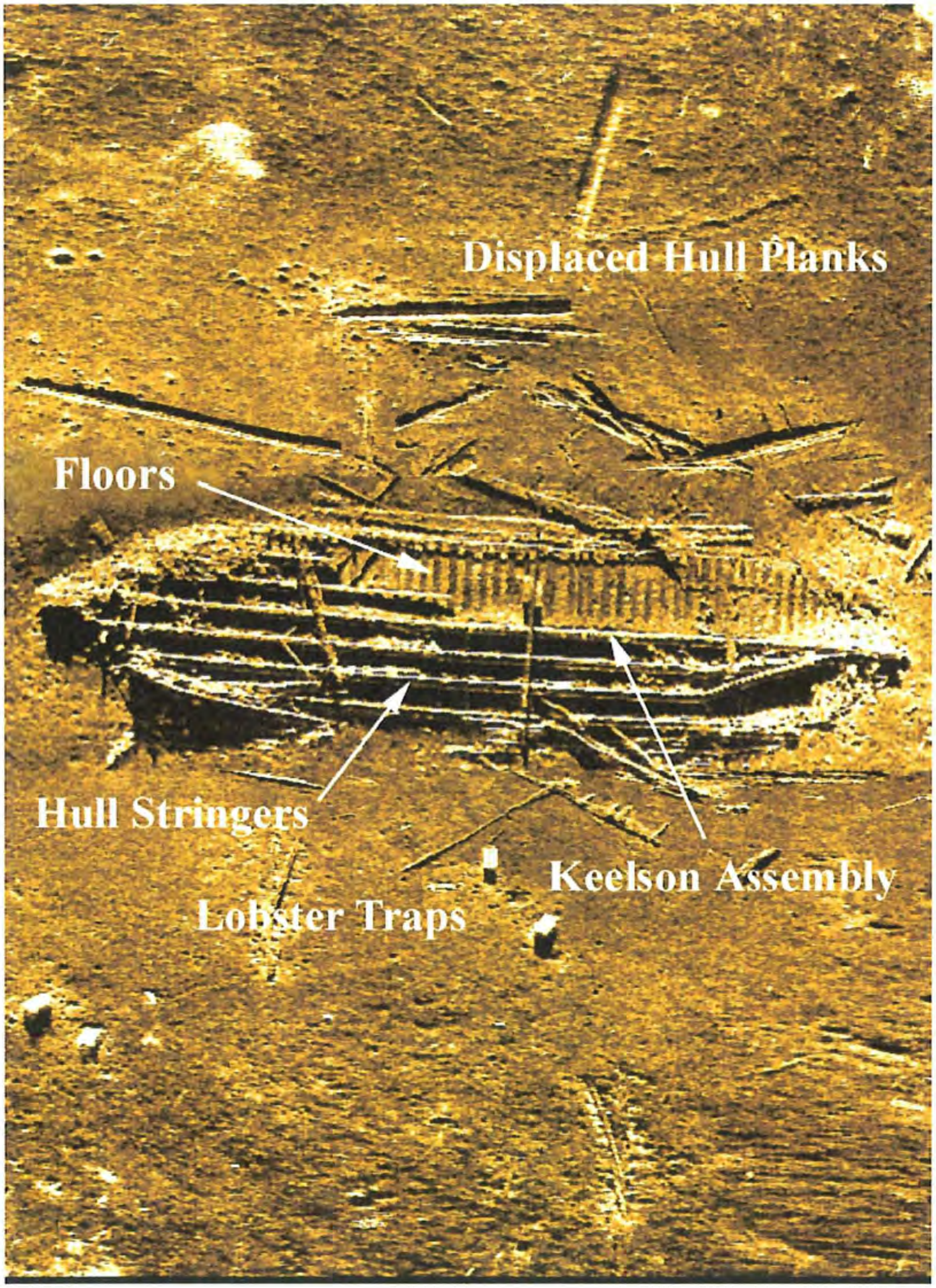

Figure 5-5. High-resolution image of the Searsport Harbor shipwreck recorded using the Klein 3000 500 kHz side-scan sonar.

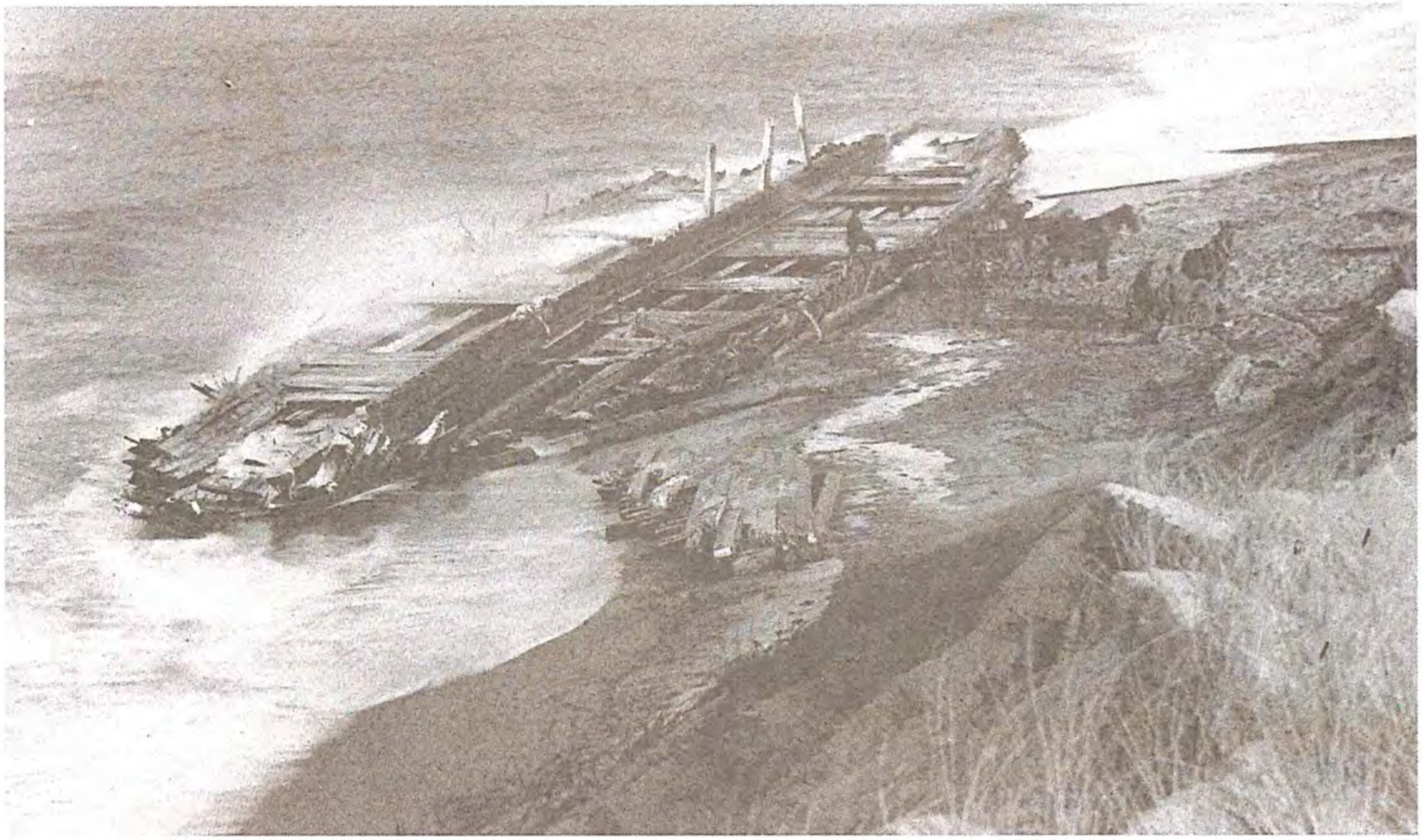

Figure 5-6. Wreck of the early-twentieth-century schooner-barge, *Pine Forest*, aground on a beach in Cape Cod, January 10, 1911 (source: Morris 1984).

THE REPUBLICAN JOURNAL

BELFAST, MAINE, THURSDAY, JUNE 2, 1938

5 CENTS

JOURNAL ADS BRING BEST RESULTS

Convention June 6-9

FEYLER INC., BUYS HAMILTON FISH MKT.

A Golden Wedding In Prospect

G.A.R. Bodies Attend Memorial Services Sunday

Rev. Frederick D. Hayes Deliver Address to Large Crowd In Attendance

Local Officers and Federal Men Locate Large Still in Frankfort

BARGE IN SEARSPORT BURNS AND SINKS

BACCALAUREATE AT MORSE HIGH SCHOOL

Commencement at Crosby Begins Sunday, June 5

Graduation Exercises and

FREEDOM GRAMMAR SCHOOL GRADUATION

Memorial Day Observed Here

Clark Camp in Charge of Parade and Program at Cemetery

BARGE IN SEARSPORT BURNS AND SINKS

Capt. William Bagley, his wife, Cleo, and three members of the crew, James Thompson of Dukesport, Ala., John Jensen of Norway and Charles L. Jones of Prince Edward Island, escaped with most of their personal belongings Saturday morning after fire, starting from an explosion, swept through the 1,500-ton barge Cullen No. 18 operated by the Cullen Transportation Company, while she was at anchor in Searsport.

Saturday night a Coast Guard patrol boat stood by with orders to sink her with their one-pounders if she did not go to the bottom within the next 24 hours.

The explosion causing the blaze occurred at 2 o'clock, in the boiler room of the donkey engine, the hose line being put out of commission. The captain and crew fought the flames as best they could until 8 o'clock, when they abandoned the craft and came ashore.

Meantime the Coast Guard at Rockland had been notified and sent the patrol boats 211 and 58 CD to the scene. The Coast Guardsmen tried to raise the anchor of the barge, so she could be towed to sea, but it stuck. She sank about 2:30.

The Cullen, which was built in 1900, was owned by the Delaware, Lackawanna and Western Railroad and she had recently unloaded a cargo of coal at the Penobscot Coal and Wharf Company plant.

Figure 5-7. Front-page headline from the June 2 edition of the Belfast-based newspaper, *The Republican Journal*, describing the 1938 loss of the schooner-barge *Cullen No. 18* (source: *The Republican Journal* 1938).

Though the recent gale was the most severe experienced here for years about all the damage done was to schooner Brunette, loaded with corn for Nickerson. She struck in attempting to reach the wharf and pounded badly started her keel, sprung a leak and filled. Corn was fully insured and was abandoned to the underwriters. Mr. Nickerson has since purchased it. The only other damage was to the yacht Lourine which came ashore loosing her rudder.

The Belfast Age - **Sept. 26, 1889**

The gale of last week, though short, was one of the most severe ever experienced in our harbor. Very little damage was done to shipping, as fortunately there were very few vessels in port. Schooner Brunette, with a cargo of forty-five hundred bushels of corn for Nickerson, in an attempt to get to the wharf grounded a few feet off and lay in a bad position, started keel and filled, damaging the vessel and cargo extensively. The corn was fully insured. Yacht Nancy Lee drifted ashore and lays high and dry on the beach with very little damage. Several signs were blown down and shade trees damaged.

The Republican Journal
Sept. 26, 1889

Figure 5-8. Descriptions of the 1889 loss of the Searsport-built schooner *Brunette* that appeared in September 26 editions of the newspapers, *The Belfast Age*, and *The Republican Journal* (source: *The Republican Journal* 1889).

A schooner barge, by definition, was a vessel that was normally towed from port to port by a tug, but was different from other barges in that it carried sails on masts that were considerably shorter than those in use by most normal schooners (Morris 1084:2). The sails were intended to provide additional thrust that would expedite the progress of the tow when the wind was from abaft the beam. Because of their reduced rig, schooner barges could be handled by small crews of just 3 to 4 people while sailing (Morris 1984:2).

In the years following the Civil War, coal was the industrial energy source that was most heavily in demand. Working in tandem with railroad lines, schooner barges were used in "tows" (Figure 5-9) to transport vast quantities of coal from the Mid-Atlantic to ports in New England during the heyday of the coal shipping industry (ca. 1875-1930s). The use of fuel oil and the diesel engine signaled not only the end of the coal era, but more importantly the end of the schooner-barge vessel type and the United States' wooden sailing ship-building era (Morris 1984:73-77).

Recommendations

The Upper Penobscot Bay region and Searsport Harbor area have a long history of intensive maritime activity spanning the pre- through post-contact periods. Systematic, multidisciplinary archival and remote sensing archaeological field survey of the Searsport Harbor study area documented a single cultural target on the surface of the sea floor within the Searsport Harbor project area - the wreck of the historic schooner-barge *Cullen No. 18*, as well as sub-bottom profiler reflectors that appear to be intact elements of the buried paleolandscape that could contain in situ early pre-contact period archaeological deposits.

Based on the results of this study, additional archaeological investigations within the Searsport Harbor project study area are recommended. These investigations should consist of:

1. a limited program of vibratory coring to ground-truth the reflectors associated with the formerly subaerially exposed paleolandsurface, especially in the vicinity of the identified paleochannel feature, and determine the presence/absence of archaeologically sensitive intact paleosols within the Searsport Harbor project's vertical area of potential effect (APE); and

2. visual inspection of shipwreck target SS375 using either archaeological divers and/or a remotely operated vehicle (ROV) to preliminarily assess the site's National Register eligibility.

Given the site's poor visibility, strong tidal currents, and the potential hazards associated with diving in proximity to the entangled fishing gear present on the site, using an ROV may provide the safest and most efficient solution for inspecting the wreck. In the event an ROV is used, it should be equipped with an acoustic positioning system to track and record its movement on site, a high-resolution digital video camera to visually document the site, a dual laser measuring system, a metal detector, and a prop-thrust-deflector to enable removal of sediments covering portions of the wreck and the performance of limited excavation.

Figure 5-9. Schooner-barges under tow (Morris 1984).

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APPENDIX A

PROJECT SCOPE OF WORK

US Army Corps
of Engineers®

STATEMENT OF WORK
MARINE ARCHEOLOGY AND MARINE GEOPHYSICS
SEARSPORT HARBOR MAINE
AND
PORTSMOUTH HARBOR, PISCATAQUA RIVER, NEW HAMPSHIRE AND MAINE

Prepared for

Planning Branch

by

Geo-Environmental Branch
New England District
Concord MA

6 November 2006

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LIST OF ACRONYMS

AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
DQO	Data Quality Objective
EM	Engineer Manual
ft	Feet
GDA	Government Designated Authority
MLLW	Mean Lower Low Water
MLW	Mean Low Water
NAD	North American Datum
NOAA	National Oceanographic and Atmospheric Administration
THFZ	Turtle Head Fault Zone
USACE	United States Army Corps of Engineers

1.0 INTRODUCTION

1.1 Project Description

The United States Army Corps of Engineers New England District (USACE) is preparing to undertake a channel deepening project at Searsport Harbor in Maine (Figure 1). As part of this effort, a marine archaeological and geophysical survey will be conducted to assess site conditions.

An optional effort is additional marine archaeological and geophysical survey on a portion of the Piscataqua River (Figure 2) during the same mobilization.

1.2 Task Overview

Services to be performed under this scope of work are described in this document. This is a firm fixed-price contract. Costs shall be priced on a per task/option basis. Contractor effort shall include reasonable time for delay due to coordination with navigation traffic and Harbor Master, logistics, set-up, etc. Contractor shall sequence executable work to minimize potential for downtime or delay.

1.2.1 Base Tasks

TASK 1 - Preparation of Work Management Plan, Health and Safety Plan, and Activity Hazard Analysis

TO BE COMPLETED BEFORE MOBILIZATION

Prepare draft and final Health and Safety Plan and Activity Hazard Analysis for tasked and optional fieldwork, and mobilization and demobilization with the exception of Task 9 where the Health and Safety Plan and Activity Hazard Analysis will be included as part of the Task 9 deliverables. See Section 6.0 for details.

Prepare draft and final work management plan to cover field tasks at Searsport Harbor and Optional field tasks on the Piscataqua River. See Section 8.2 for details.

TASK 2 - Searsport Harbor Marine Geophysical and Remote Sensing Archaeological Survey

Perform marine geophysical and remote sensing archaeological survey, consisting of seafloor imaging (sidescan sonar and magnetometer), and subbottom profiling (seismic reflection) within the areas being studied in/along the Searsport Harbor Navigation Channel.

See Section 4.0 MARINE GEOPHYSICS, of this Statement of Work for general requirements for magnetometer, sidescan sonar, and subbottom profiling (seismic reflection). For this task , magnetometer line spacing not exceeding 50 feet would result in a total of approximately 73 nautical miles of linear magnetometer data. Cross lines for subbottom profiling shall be run where they can intersect existing boring data, and shall not exceed 6 lines total.

Bottom elevations within the study area range between -10 and -53 ft below MLLW (Figure 1).

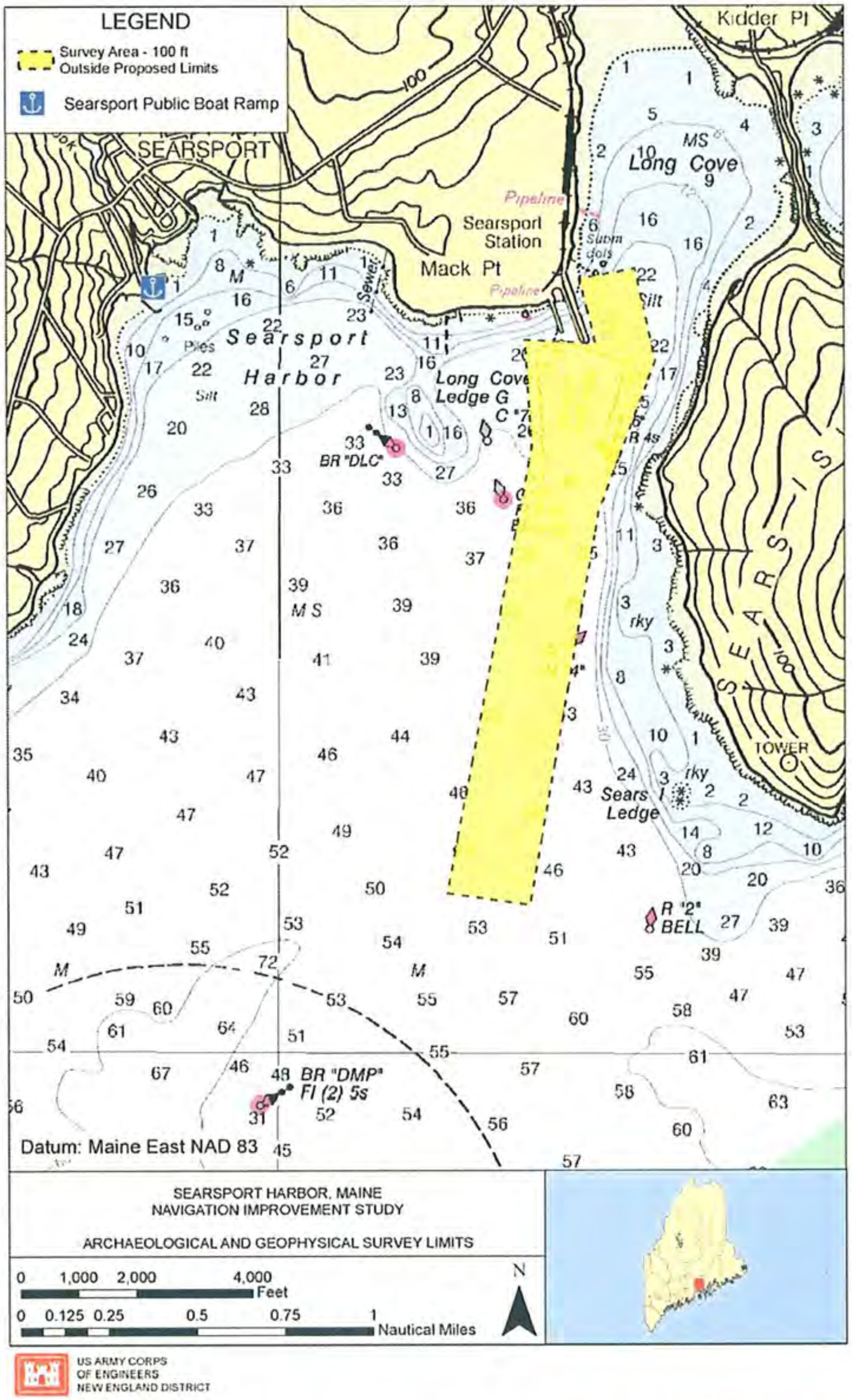

Figure 1. Searsport Harbor Maine study area and nearby public dock (soundings are ft below MLLW).

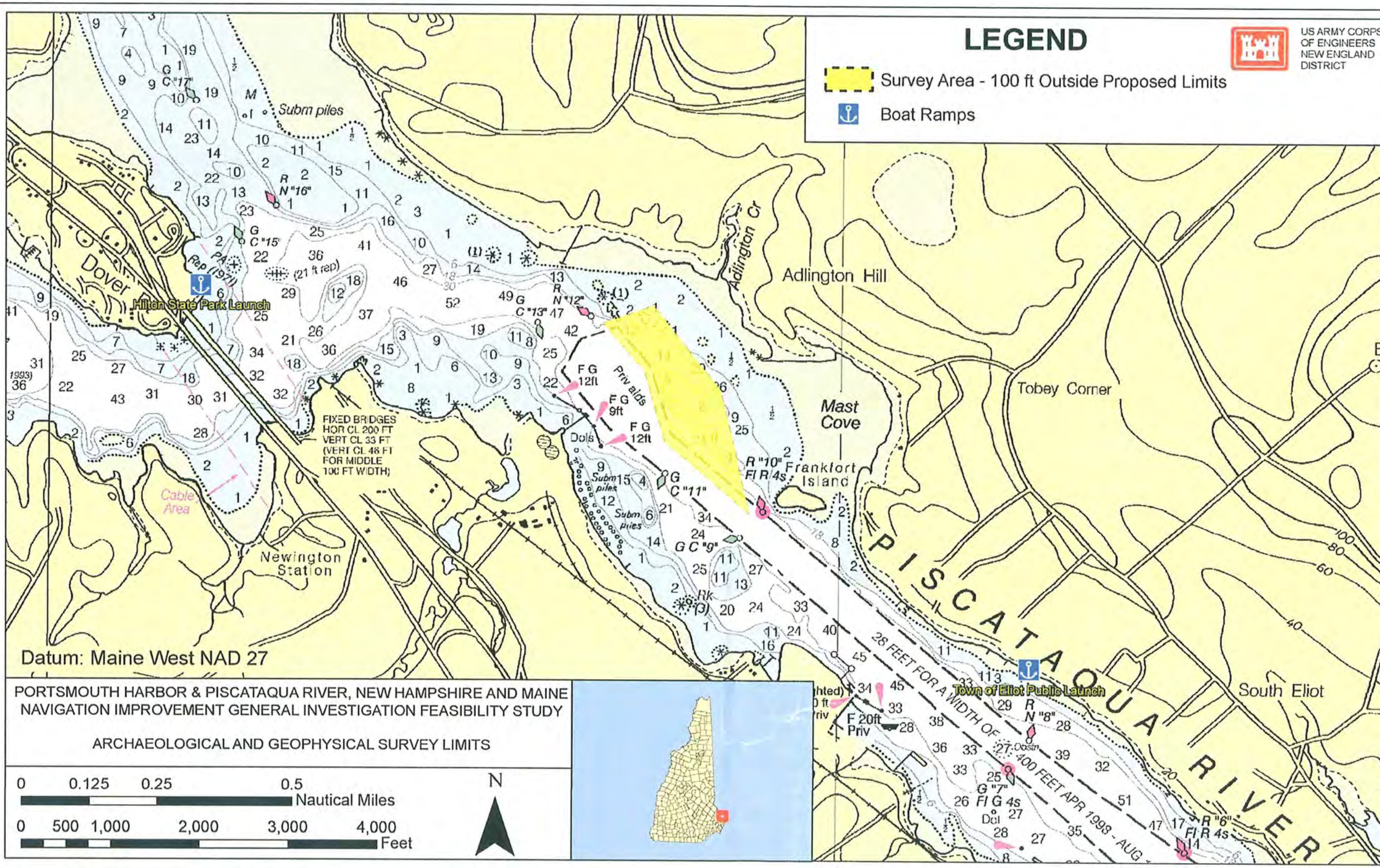

Figure 2. Location of the Piscataqua study area and nearest public boat ramps (soundings are ft below MLLW).

1.2.2 Optional Tasks – To Be Completed At USACE Direction

OPTIONAL TASK 3 - Piscataqua River Marine Geophysics and Remote Sensing Archaeological Survey

Perform marine geophysics and remote sensing archaeological survey, consisting of seafloor imaging (side scan sonar and magnetometer), and subbottom profiling (seismic reflection) within the areas being studied in/along the Piscataqua River Navigation Channel.

See Section 4.0 MARINE GEOPHYSICS, of this Statement of Work for general requirements for magnetometer, sidescan sonar, and subbottom profiling (seismic reflection). For this task, magnetometer line spacing not exceeding 50 feet would result in a total of approximately 7 nautical miles of linear magnetometer data. Cross lines for subbottom profiling shall be run where they can intersect existing boring data, and shall not exceed 3 lines total.

Bottom elevations range between -2 and -24 ft below MLLW (Figure 2).

OPTIONAL TASK 4 - Searsport Harbor Marine Archeology Report (Technical Evaluation, Literature Review and Assessment, Data Processing and Post Processing)

Prepare and submit report, including (1) discussion of field work and presentation of results (field reports, magnetometer results, side scan sonar images, profiles, electronic data files, discussion of equipment and methods, etc.), (2) and archaeological assessment and survey findings, including resources identified, magnetic anomalies encountered, and, if necessary, recommendations for further investigations.

Work includes preliminary interpretation of geophysical data, technical evaluation of results with respect to project objectives, tabulated locations of wrecks, suspected wrecks, debris and debris fields. Any significant archaeological findings shall be presented, including an assessment of the current project area, preliminary statements of resource significance and the identification of anomalies requiring additional evaluation. A qualified archaeologist familiar with the area and underwater prehistoric resources shall provide an assessment of the prehistoric potential of the study area.

General research guidelines for literature review and assessment (archaeological and historic resources):

a. A literature search shall be conducted of the project area not to exceed 1 man day. This should be geared toward obtaining information pertaining to the cultural resources in the area and/or the potential of their existence. Information and data for the literature search shall be obtained but not be limited to the following sources:

(1) Published and unpublished reports such as books, journals, theses, manuscripts and dissertations.

(2) Maritime archaeological site files at local universities, the State Historic Preservation Offices, and local historical societies and museums.

(3) Consultation with qualified professionals familiar with the underwater cultural resources in the area, as well as consultation with professionals in associated areas such as history or geology, as deemed necessary.

b. Information should be included concerning any cultural resources in the proposed area that have been listed on or are potentially eligible for nomination to the National Register of Historic Places. Information gathered during the literature review may be tailored to meet the needs of the presentation required above, however, the bulk of the data shall be included in the report.

OPTIONAL TASK 5 - Searsport Harbor Marine Seismic Report (Technical Evaluation, Literature Review and Assessment, Data Processing and Post Processing)

Prepare and submit report, including (1) discussion of fieldwork and presentation of results (field reports, magnetometer results, seismic reflection profiles, electronic data files, discussion of equipment and methods, etc.), (2) finalized geologic interpretation of geophysical data and technical evaluation of results with respect to project objectives, including bedrock topographic maps and recommendations for future subsurface investigations, and (3) table of proposed boring locations, estimated total depth, and rationale (verify interpretation, investigate anomalous bedrock zone, fill in area where bedrock data is missing due to gas-bearing sediments).

Work includes preliminary interpretation of geophysical data, technical evaluation of results with respect to project objectives, identification of areas considered questionable or likely to have hard material (bedrock, cobbles, etc.) within the dredge limits and recommend actions for future subsurface investigations. Other items of interest include areas having large expanses of mud/fines (greater potential for contamination), and areas where depth to bedrock would preclude excavation.

General research guidelines for literature review and assessment:

a. A literature search shall be conducted of the project area not to exceed 1 man day. This should be geared toward obtaining information pertaining to the geology of the area and/or past geophysical surveys. Information and data for the literature search shall be obtained but not be limited to the following sources:

(1) Published and unpublished reports such as books, journals, theses, manuscripts and dissertations.

(2) United States and Maine Geological Surveys, and files at local universities.

(3) Consultation with qualified professionals familiar with the underwater and shore geology, as deemed necessary.

OPTIONAL TASK 6 - Piscataqua River Marine Archeology Report (Technical Evaluation, Literature Review and Assessment, Data Processing and Post Processing)

Prepare and submit report, including (1) discussion of field work and presentation of results (field reports, magnetometer results, side scan sonar images, profiles, electronic data files, discussion of equipment and methods, etc.), (2) and archaeological assessment and survey findings, including resources identified, magnetic anomalies encountered, and recommendations for further investigations.

Work includes preliminary interpretation of geophysical data, technical evaluation of results with respect to project objectives, tabulated locations of wrecks, suspected wrecks, debris and debris fields. Any significant archaeological findings shall be presented, including an assessment of the current project area, preliminary statements of resource significance and the identification of anomalies requiring additional evaluation. A qualified archaeologist familiar with the area and underwater prehistoric resources shall provide an assessment of the prehistoric potential of the study area.

General research guidelines for literature review and assessment (archaeological and historic resources):

a. A literature search shall be conducted of the project area, and not exceed 1 man day. This should be geared toward obtaining information pertaining to the cultural resources in the area and/or the potential of their existence. Information and data for the literature search shall be obtained but not be limited to the following sources:

(1) Published and unpublished reports such as books, journals, theses, manuscripts and dissertations.

(2) Maritime archaeological site files at local universities, the State Historic Preservation Offices, and local historical societies and museums.

(3) Consultation with qualified professionals familiar with the underwater cultural resources in the area, as well as consultation with professionals in associated areas such as history or geology, as deemed necessary.

b. Information should be included concerning any cultural resources in the proposed area that have been listed on or are potentially eligible for nomination to the National Register of Historic Places. Information gathered during the literature review may be tailored to meet the needs of the presentation required above, however, the bulk of the data shall be included in the report.

OPTIONAL TASK 7 - Piscataqua River Marine Seismic Report (Technical Evaluation, Literature Review and Assessment, Data Processing and Post Processing)

Prepare and submit report, including (1) discussion of field work and presentation of results (field reports, magnetometer results, seismic reflection profiles, electronic data files, discussion of equipment and methods, etc.), (2) finalized geologic interpretation of geophysical data and technical evaluation of results with respect to project objectives, including bedrock topographic maps and recommendations for future subsurface investigations, and (3) table of proposed boring locations, estimated total depth, and rationale (verify interpretation, investigate anomalous bedrock zone, fill in area where bedrock data is missing due to gas-bearing sediments).

Work includes preliminary interpretation of geophysical data, technical evaluation of results with respect to project objectives, identification of areas considered questionable or likely to have hard material (bedrock, cobbles, etc.) within the dredge limits and recommend actions for future subsurface investigations. Other items of interest include areas having large expanses of mud/fines (greater potential for contamination), and areas where depth to bedrock would preclude excavation.

General research guidelines for literature review and assessment:

a. A literature search shall be conducted of the project area, and not exceed 1 man day. This should be geared toward obtaining information pertaining to the geology of the area and/or past geophysical surveys. Information and data for the literature search shall be obtained but not be limited to the following sources:

(1) Published and unpublished reports such as books, journals, theses, manuscripts and dissertations.

(2) United States and Maine Geological Surveys, and files at local universities.

(3) Consultation with qualified professionals familiar with the underwater and shore geology, as deemed necessary.

OPTIONAL TASK 8 - Weather Day

TO BE EXERCISED DURING FIELD PROGRAM IF NEEDED.

Item shall include costs incurred due to one down day due to weather, with vessel and equipment idle, and crew not working.

OPTIONAL TASK 9 - Searsport Harbor Wreck Assessment

Field Work

a. All sites are to be drawn, photographed, videotaped or documented by any other means, as is common archaeological practice for the identification and evaluation of submerged cultural resources. The purpose of this fieldwork is to provide a preliminary assessment of submerged cultural resources; no formal National Register eligibility documentation or field survey will be required at this time. Any sites of potential significance are to be recorded, documented and left in-situ for purposes of further coordination and consultation.

Inspection of the wreck site will include the dropping of an anchored buoy followed by the diving to the area to conduct a systematic search and recording of the target. This work should be undertaken with the use of an archaeological diving crew, as opposed to a commercial diving unit, although commercial divers may assist under the supervision of the Underwater Archaeologist. **The minimum dive team is a four-person crew. This may not include the boat operator, unless the operator is part of the normal dive team and precautions are in place.**

b. All work to be accomplished will be in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716, September 29, 1983) and the Advisory Council on Historic Preservation's Handbook "Treatment of Archaeological Properties" (1980). The qualifications for leading an historic shipwrecks project must be met, as specified by the National Park Service in the "Abandoned Shipwreck Guidelines" published in the Federal Register, Volume 50, Number 233, on December 4, 1990.

c. The Contractor will be responsible for the obtaining of a permit for the performing of underwater archaeological explorations as required by the Maine Historic Preservation Commission, prior to the implementation of fieldwork. No subsurface excavation will be conducted.

d. An accident prevention plan (APP) and site-specific detailed diving plan should be prepared and be available for review and approval by the Government prior to the initiation of fieldwork. Special attention shall be focused on the requirements of the US Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1 (dated 3 September 1996), and particularly Appendix A, (Minimum Basic Outline for Accident Prevention Plan), and Section 30 (Contract Diving Operations). A copy of the Appendix A requirements and Section 30 will be provided by Corps upon request. Work **shall not** proceed until the APP has been reviewed by the Corps and accepted by the Contracting Officer Representative. **Diving may not take place unless a USACE Certified Diving Inspector is present on-site.**

Report and Graphics Production

a. Draft Report. The Contractor shall prepare, within 30 days of completion of fieldwork, a draft report of the wreck inspection survey results and recommendations for further research and evaluation, if necessary. Upon completion of the draft report, the Contractor shall submit 10 copies to the Government for review and comment. The review of the report will focus on format, method of preparation and compliance with applicable contract requirements. The Government will provide the Contractor consolidated review comments within 20 days of the submittal of the draft report. Upon receipt of the review comments, the Contractor shall make all necessary changes or corrections and develop a Final report within twenty (20) calendar days.

b. Final Report. The Contractor shall submit ten (10) copies of the Final report version, including one unbound copy, a copy of the electronic files in Microsoft Office format, original black and white photographs and/or a copy of the DVD, no later than twenty (20) days after the receipt of any Government review comments from the draft report. Comments should be addressed within the final version of the report; otherwise reference to other resolution should be included.

All data, reports, and related materials obtained as a result of this contract shall become the property of the U.S. Government and shall be turned over to the Contracting Officer, upon completion of the contract, **with the exception of any cultural remains or artifacts recovered as a result of the study. These resources are the property of the State of Maine, except in cases stipulated within the Standards and Guidelines for Abandoned Shipwrecks Investigations.**

1.3 Background Geology

1.3.1 Searsport Harbor

Bedrock underlying the study area consists of thick-bedded biotite, quartzites, schists, massive meta-graywacke or andesite tuffs of the Penobscot Formation (Kasuba and Simpson, 1989). The northeast-southwest trending Turtle Head Fault Zone (THFZ), located southeast of Sears Island (Figure 1), separates the Penobscot Formation to the north from the Ellsworth Formation and coastal volcanics to the south (Hogan and Sinha, 1989). The Ellsworth Formation and coastal volcanics units consist of bedded, buff-weathered quartzite; some metamorphosed mafic volcanics, as well as some rusty weathering pellites and minor limestones. The bedrock surface about 1.5 nautical miles south of Sears Island contains bedrock pinnacles exceeding 60 feet in amplitude (Belknap, Kelley and Gontz, 2002).

Till sequences overly most of the bedrock, except where bedrock pinnacles reach 60 feet or more above the bedrock base. The Waldoboro moraine runs along the north-western coastline of Penobscot Bay. End moraine deposits are found running east to west. The southern part of Sears Island (Figure 1) contains various types of till and outwash sand deposits (Gerber, 1976), which are likely present in the harbor sediments west of the island.

The Presumpscot Formation overlies the till units, and consists of mostly glaciomarine mud with sand layers and gravel dropstones (Belknap, Kelley and Gontz, 2002). Fine grained sediment eroded from glaciomarine and till bluffs north of the study area are carried by the Passagassawakeag River and deposited in Penobscot Bay. Sediment cores south of Sears Island show thick Quaternary sediment beds of sand, gravel and estuarine mud. Detrital organic material (wood, bark and grass fragments) was retrieved from 1 vibracore south of Sears Island (Belknap, Kelley and Gontz, 2002).

Numerous large pits are present in the Belfast Harbor sediments about five miles west of Sears Island, and have a typical size of 500-foot diameter by 50-feet deep. Sidescan sonar shows these pits to be present as far east as the midpoint between Sears Island and the mainland to the west (NOAA, 1999). It is not known if source of decaying organic matter is related to peat in glacial till or sawmill waste materials (Caldwell, 1998). Marine seismic reflection data suggest the uppermost unit of the harbor sediment sequence is natural gas-rich, and can negatively affect marine seismic data (Belknap, Kelley and Gontz, 2002).

1.3.2 Piscataqua River

The Piscataqua River is underlain by several Precambrian – Silurian sedimentary rocks (Caldwell, 1998). The oldest is the Rye Formation, which consists of deformed metasedimentary and felsic igneous rocks (blastomylonitic granite to granodioritic gneiss). The Eliot Formation, described as calcareous pellite, is comprised of a buff-colored, quartz-plagioclase-biotite phyllite and is strongly sheared throughout. Abundant carbonate at the lowest grades and calc-silicate minerals at higher grades are found. The Kittery Formation, calcareous feldspathic sandstone, is most commonly seen with variation in bedding thickness of tan quartzite alternating with phyllite. Grain size ranges from coarse sand at depth to fine mud closer to surface (Anderson, 1985a). Both the Eliot and Kittery Formations fall largely within the green schist facies as well as small portions of the epidote-amphibolite and low rank amphibolite facies. The Rye Formation, schists, phyllites and amphibolites, overlies sections of the Kittery and Eliot Formations (VanDiver, 1984).

The Norumbega fault, a strike-slip fault running NNE, is shown on the Maine Bedrock Geology map running North of the area (Caldwell, 1998).

The Piscataqua Riverbed is comprised mainly of glaciomarine sediment (fine grained facies) of silt, clay and sand with trace amounts of gravel, deposited by Wisconsinan glacial ice. It is not until farther upstream that coarser grained glaciomarine deposits are found. Some areas of till are present.

No references to organics gas-rich sediments were found.

1.4 Site Specific Data Acquisition and Analysis Problems

Cargo and fishing vessels actively use both areas.

Pre-glacial valley or valleys may underlie Searsport Harbor, potentially yielding a complex bedrock surface. Glacial till is likely present in the harbor, and may interfere with interpreting the bedrock surface.

Side scan sonar in Belfast Harbor and marine seismic data south of Sears Island indicate organics and gas are likely present in the sediments immediately west of Sears Island.

Mafic igneous intrusions, such as dikes, may be present in both study areas and create strong magnetic anomalies.

Limited boring data near the Piscataqua River study area suggest bedrock may be shallow.

2.0 PROJECT GOAL, OBJECTIVES, AND ASSUMPTIONS

2.1 Project Goal and Data Quality Objectives

The overall project goal is to collect archeological and design data for the Searsport Harbor channel deepening project and Piscataqua River navigation channel improvement project. The data quality objectives (DQOs) for this Marine Geophysics SOW are:

a) Assess subsurface conditions to –70 ft below MLLW
b) Locate objects or magnetic anomalies representing historic period and/or prehistoric archaeological resources and evidence of sunken vessels
c) Make recommendations for future archaeological studies based upon survey data and literature review to include inspection of identified anomalies at the intensive survey level and for the potential for submerged prehistoric resources,
d) Identify areas suspected of having material that is not easily dredged (bedrock, cobbles, dense till, hard pan, etc.) within the proposed dredge limits
e) Identifying pinnacles and large glacial erratics
f) Recommend areas for subsurface explorations (borings/probes) to verify presence of such material
g) Assess depth to bottom of water column
h) Discriminate between silt, sand, and till overburden units where geophysical contrasts permit
i) Locate potential buried utilities

This work effort will be accomplished by performing geophysical and remote sensing archaeological explorations (seismic, magnetometer, sidescan sonar, and subbottom profiling) in the areas being studied for potential navigation improvement. The data gathered from the exploration program will be used to scope intensive archaeological survey work (if warranted) and subsurface investigations in the future.

All work shall be done in accordance with USACE guidance (USACE, 2003, 2002, 2001a, 2001b, 1995).

2.2 Project Assumptions

- Searsport horizontal data shall be referenced to the Maine East State Plane NAD83 coordinate system.
- Piscataqua River horizontal data shall be referenced to the Maine West State Plane NAD83 coordinate system.
- All vertical data shall be referenced to mean lower low water (MLLW) as determined by the USACE tide gage.
- Searsport Harbor study area bedrock is deeper than 40 feet below MLLW, based on boring and probe data.
- Profiles will pass over or near existing borings to aid in the data interpretation.
- Organic-rich sediments are present in the Searsport Harbor area.
- The Contractor shall notify and brief the Harbor Master and Coast Guard prior to commencing field operations.

- The contractor will identify geophysical signatures suggesting utilities or other manmade features (charted and uncharted), but these interpretations shall not constitute a utility survey, which is beyond the scope of this effort.
- Preliminary draft and draft data plots and a brief write-up describing identified features, and are due 21 and 45 calendar days from the completion of fieldwork, respectively.
- The Contractor shall follow USACE safety requirement as spelled out in the Accident Prevention Plan.
- USACE shall provide:
    - The most recent condition survey plans (full-size) for the areas being studied in/along the navigation channel.
    - Description of Survey control points used for each hydrographic study
    - HYPACK electronic files containing the bathymetric data for the study areas compatible with Microstation.

3.0 PROJECT REQUIREMENTS

a. General. The Contractor shall provide all necessary labor, materials, and equipment necessary to complete the specified marine geophysics and remote sensing archaeological survey. The Contractor shall provide well-maintained and calibrated equipment, and a qualified crew experienced in all phases of marine geophysical and remote sensing archaeological explorations.

b. Qualifications. **Geophysical**: The lead geophysicist shall have at least five years experience conducting and interpreting results of marine geophysical explorations in New England. **Archaeological**: All work to be accomplished will be in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716, September 29, 1983), and the Advisory Council on Historic Preservation's Handbook "Treatment of Archaeological Properties" (1980). The qualifications for leading an historic shipwrecks project must be met, as specified by the National Park Service in the "Abandoned Shipwreck Guidelines" published in the Federal Register, Volume 50, Number 233, on December 4, 1990.

c. Coordination. All details presented in this document are subject to change by USACE as the work progresses. Close coordination with the USACE point-of-contact listed is required during the operations to determine final details.

d. Utilities. Prior to starting any field work, Contractor shall contact the necessary agencies (DIG-SAFE) and/or utility companies to identify any utilities or other features in the areas to be explored, so they can be avoided and protected from damage by any invasive activities that may be taken during the explorations (setting anchors, etc.).

4.0 MARINE GEOPHYSICS

4.1 General Requirements

4.1.1 Density of Coverage

The distance between remote sensing transects should be determined by background research and an expectation of the kinds of wrecks likely to be encountered. Parallel line spacing for the magnetometer should not exceed 50 feet. Parallel line spacing for marine seismic data acquisition shall not exceed 150 feet. The number of lines should be sufficient to acquire 100% sidescan sonar coverage of proposed dredge area, including some overlap along the edges, to generate a bedrock contour map and identify potential archeological targets. It is anticipated that geophysical lines will be run roughly parallel to the channel, with cross lines (perpendicular) approximately every 500 to 1,500 feet of channel length, as needed to aid in interpretation of the data. Lines should provide adequate coverage, extending slightly beyond the channel limits, to ensure that significant masses of bedrock, cobbles, etc. are not missed along the edges of the channel. Contractor shall propose geophysical track line array, because selection may be influenced by weather, logistics, geology, field findings, etc. Lines will be numbered and identified in a fashion that will allow ease of use, and will avoid mistaking lines made in different areas. Contractor shall propose nomenclature for identifying lines.

4.1.2 Vessel, Navigation, and Positioning

Vessel shall be sufficiently sized and equipped to conduct the required explorations, providing for protection of instrumentation and electronics, and able to accommodate the crew, captain, as well as visitors (1 to 2 Corps personnel). A Safe Boater certified captain shall captain the vessel. Contractor is responsible for making all Notices to Mariners, the Harbor Master, and other vessels operating in the area. The vessel shall be equipped with a Differential Global Positioning System (DGPS) with navigation software (HYPACK or equivalent) to enable the vessel captain to steer-to navigate, to stay on course and run straight and accurate data collection lines. Lines should be run as straight and on-course as conditions will allow. DGPS shall be accurate to within 5 feet horizontally, and 1 foot vertically. Geophysical instruments shall be integrated with the DGPS so that the data can be tagged with position and time information at regular intervals during data collection. All horizontal data shall be referenced to the site specific horizontal datums, and vertical data shall be referenced to Mean Lower Low Water (MLLW) to match datum currently being used in USACE drawings. Position and dimension results shall be provided in English units, to be consistent with existing USACE plans. Geophysical units shall be metric.

4.1.3 Marine Magnetometer

Magnetometer data (Geometrics G-881 or other suitable equipment) will be considered as part of this evaluation to identify any metallic features on the bottom that could represent cultural resources and/or could affect the navigation improvement dredging being considered.

4.1.4 Seafloor Imaging

An appropriate side scan sonar (Klein Model 540, EG&G Model 260 with Model 272-T towfish, EG&G Model DF-1000 in-water towfish, or equivalent) and data collection and processing system will be used to generate images of bottom conditions. Images will be interpreted by an experienced side scan sonar operator, to identify geologic material types present at the surface (mud, bedrock, etc.), and aid in identifying potential cultural resources that warrant further investigation and other features that could impact a dredging operation (utilities, pipes, debris, obstructions, shipwrecks, etc.).

4.1.5 Subbottom Profiling

Contractor shall mobilize to the site the appropriate seismic reflection equipment necessary to perform subbottom profiling of the Areas. Contractor shall select the most appropriate equipment to provide the appropriate balance between depth penetration and resolution for the conditions within each portion of the study area. Lower frequency equipment has greater depth penetration, but lower resolution (EG&G Uniboom, ORE Geopulse, Edgetech X-Star System with low frequency towfish, etc.), while higher frequency equipment gives higher resolution, but does not penetrate as deep (DataSonics 6600 Chirp System, Raytheon RTT 1000a, Edgetech X-Star System with high-frequency towfish, etc.). The maximum dredge depth being considered is –45-ft MLLW (-47-ft MLLW including 2 feet overdredge), but the exploration program should be geared to acquire high-quality data to –52-ft MLLW. If acoustically opaque gas (entrapped in mud) is encountered, the Contractor need not propose any extraordinary measures to penetrate the mud acoustically, but these areas should be identified and noted.

4.1.6 Interpretation

An experienced, qualified marine geophysicist shall interpret the geophysical data collected, and make best judgment assessments of the presence and limits (horizontally and vertically) of hard material within the dredging limits of the study area. The geophysicist shall also note the places in the geophysical data where there is greater uncertainty in the interpretation, and other places where subsurface investigations could add the most value (at cross-points of the geophysical lines, for example). See Section 2.1 for data interpretation and presentation requirements.

The project archaeologist shall evaluate both magnetometer and sidescan sonar results in tandem, as well as subbottom profiling, when identifying potential cultural resources.

4.2 Base and Optional Study Areas

4.2.1 Contract Base – Searsport Harbor

Coordinates for the entire study area shown in Figure 1 are listed in Table 1.

Table 1. Points defining the Searsport Harbor study area are listed below (Maine State Plane, NAD83).

Point	Northing	Easting
1	287375	881678
2	286177	882106
3	283650	881159
4	277663	880108
5	277860	878712
6	283611	879806
7	285984	879651
8	285896	880773
9	286921	880407

Figure 3 shows a portion of the Searsport study area and location of available boring and probe data. Boring and probe data is summarized in Table 2.

Table 2. Searsport Harbor boring data (coordinates in Maine State Plane NAD83).

Boring	Northing	Easting	Surface Depth (ft below MLW)	Total Depth of Boring (ft below MLW)	Details (depth units are in feet)
H-3	286015.161	880514.789	-22.5	-52	-22.5' to -35.5 (Mud); -35.5' to -43.5' (Gravel, rocks, clay); -43.5' to -52' (Loose sand and gravel with boulder obstruction on bottom)
M-4	285965.162	880652.789	-23.5	-60	-23.5' to -38.5' (Mud); -38.5' to -44' (Hard Clay); -44' to -60' (Sand and gravel with little clay)
W-5	286027.164	880839.786	-22	-64	-22' to - 32.5' (Mud); -32.5' to -52' (Hard Clay); -52' to -64' (Clay, sand & gravel)
FD-1	284477.17	879976.81	-30.1	-40.1	-30.1 to -40.1' (Organic SILT with occasional shells)
FD-2	284965.17	880514.8	-30.5	-40.5	-30.5' to -40.5' (Organic SILT with occasional shells)
FD-3	285615.17	881326.79	-30.9	-40.9	-30.9' to -38.9' (Organic SILT with occasional shells to organic SILT with occasional shells a trace of sand); -38.9' to -40.9' (CLAY in laminated layers)
FD-4	286040.16	880126.79	-23.2	-43.2	-23.2' to -31.8' (Organic SILT); -31.8' to -33.2' (CLAY); -33.2' to -35.2' (Organic SILT); -35.2' to -43.2' (CLAY)

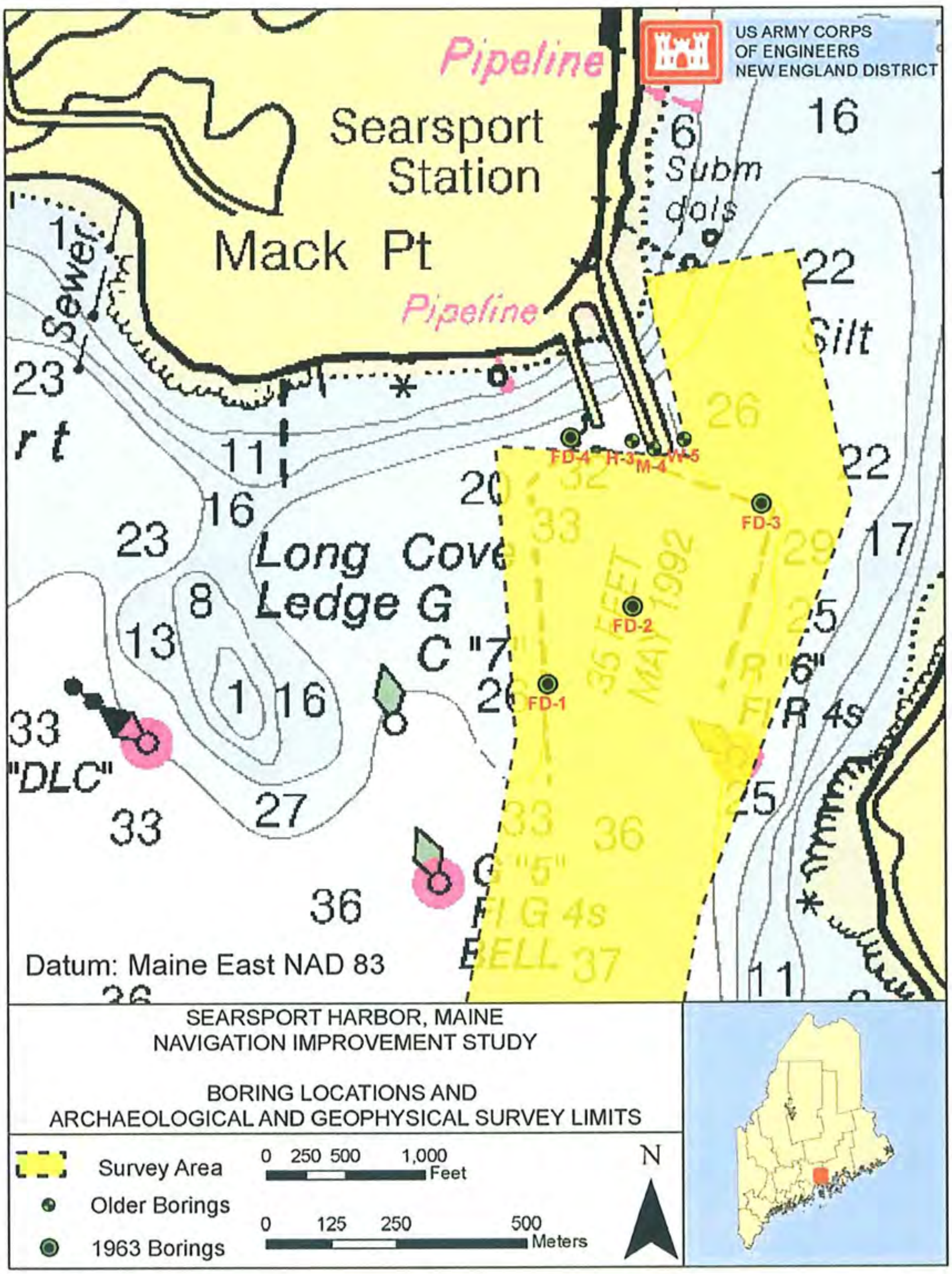

Figure 3. Northern portion of the Searsport study area and borings (see Table 2) (soundings are ft below MLLW).

4.2.2 Contract Option – Piscataqua River Turning Basin

Figure 4 shows the Piscataqua study area and location of available boring and probe data. Coordinates for the study area polygon are in Table 3.

Table 3. Points defining the Piscataqua River study area are listed below (Maine West State Plane, NAD27).

Point	Northing	Easting
1	105174.757	328653.9
2	104225.074	329410.631
3	102712	329896
4	103638.256	328777.994
5	104460.107	328542.193
6	104977.482	328091.73

Two probes completed near the proposed turning basin show mud, sand and loose stone in retrieved samples (Table 4, Figure 4). Probe Number 11 went to a depth of 37.4-ft below MLW and penetrated 6.1-ft before hitting refusal. Depth of water was 31.5-ft. Probe Number 18 went to a depth of 32.7-ft below MLW before hitting refusal after 8.9 feet. Depth of water was 29.4-ft. These probes were taken with a pointed ¾" iron pipe forced into the sediment by two men in a skiff. They were taken between August 31 and September 2, 1960 (USACE File No. 1505 D-8-3).

Table 4. Historic probe data near the proposed Piscataqua River turning basin shown in Figure 4 (Maine West State Plane NAD27).

Probe	Northing	Easting	Depth of Water (ft below MLW)	Depth of Probe (ft below MLW)	Penetration (ft)	Material
P-11	102879	329093	-31.5	-37.4	6.1	Mud & sand, Refusal
P-18	102800	329179	-29.8	-32.7	8.9	Loose stone - Gravel – Refusal

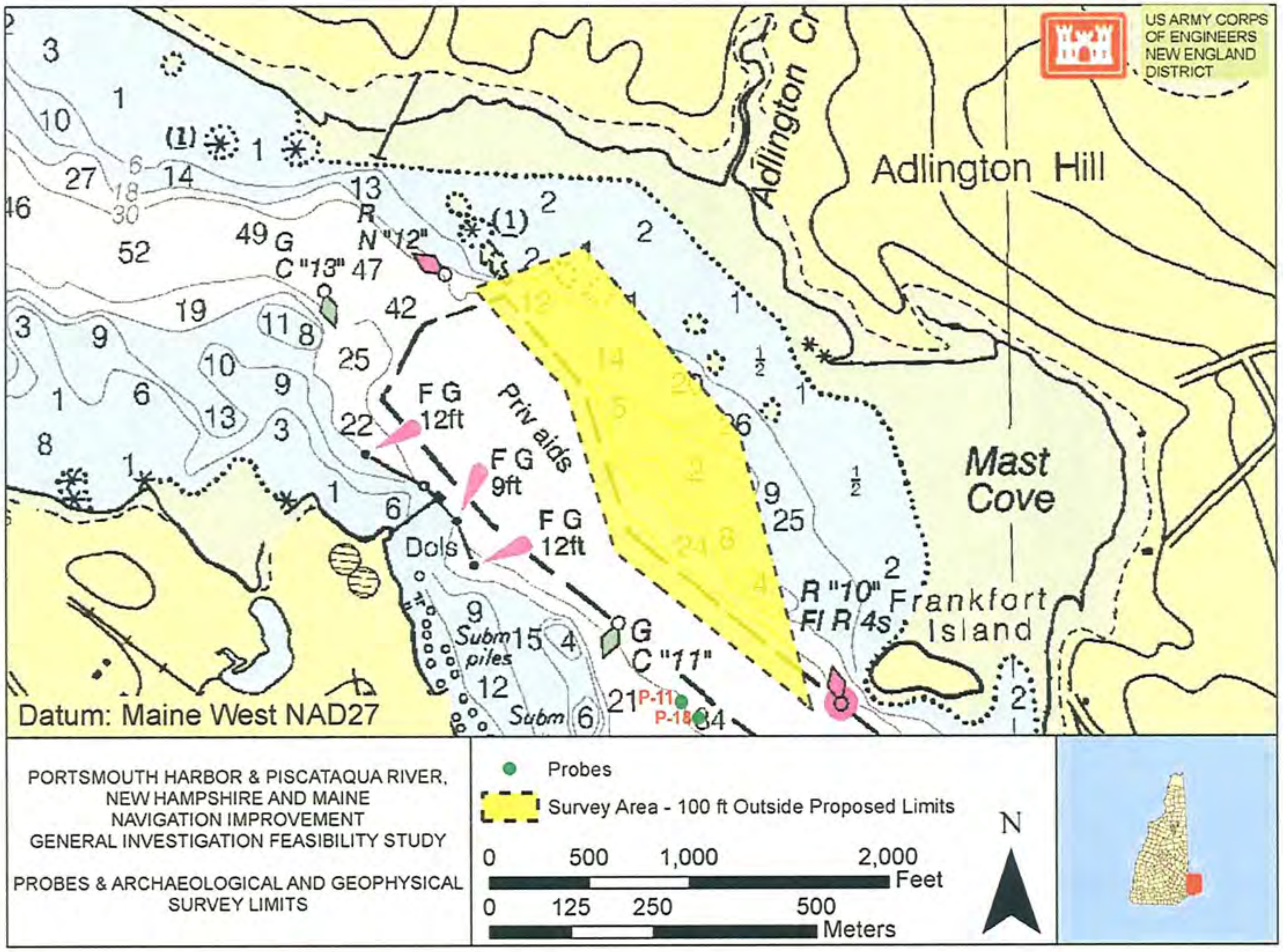

Figure 4. Location of existing probes near the proposed Piscataqua River turning basin (soundings are ft below MLLW).

5.0 REMOTE SENSING ARCHAEOLOGY

The Contractor shall utilize a systematic, interdisciplinary, synergistic approach to conducting the study. Specialized knowledge and skills will be used during the course of the study to include expertise in the disciplines of maritime archaeology, geology, history, marine architecture, and any other discipline as required. Techniques and methodologies used for the study shall be representative of the state of current professional knowledge and development.

Preliminary statements of resource significance and project impacts should be provided. A qualified archaeologist familiar with the area and underwater prehistoric resources should also provide an assessment of the prehistoric potential of the study area. Preliminary assessments of significance should be formulated.

Prepare a report describing the results of the survey, including archaeological resources identified, magnetic anomalies encountered and recommendations for further investigations. Recommendations should be made as to whether archaeological subsurface testing (i.e. vibracores) is warranted to determine the presence of submerged prehistoric deposits. Recommended locations shall be summarized in a table of prioritized proposed vibracore locations, estimated total depths, and rationales shall be included.

The report will serve several functions. It will assist USACE in fulfilling legal obligations under Section 106 of the National Historic Preservation Act of 1966 as amended and 36 CFR 800. It is also a scholarly document that not only fulfills the mandated legal requirements but serves as a scientific reference for future professional studies as well.

6.0 SAFETY AND HEALTH REQUIREMENTS

6.1 Accident Prevention Plan

The Contractor shall prepare an Accident Prevention Plan (APP) specific to the activities being performed (see Appendix A). It shall include an Activity Hazard Analysis (AHA) as described in 6.2 below. All work shall be conducted in accordance with the APP, the U.S. Army Corps of Engineers Safety and Health requirements Manual (USACE, 2003), and all applicable federal, state, and local safety and health requirements. A copy of EM 385-1-1 can be accessed electronically at www.usace.army.mil/inet/usace-docs/eng-manuals/em385-1-1.

The APP shall detail how safety and health will be managed during the project. The APP shall address the requirements of applicable Federal, State and local safety and health laws, rules, and regulations. The Contractor shall comply with Federal Acquisition Regulation Clause No. 52.236-13 for Accident Prevention, which is added by reference. Special attention shall focus on the requirements of EM 385-1-1, specifically Section 01.A.11 through 01.A.18, Figure 1-1 AHA, and Appendix A, (Minimum Basic Outline for Accident Prevention Plan). The APP shall be developed by a qualified person. The contractor shall be responsible for documenting the qualified person's credentials. Work shall not proceed until the APP has been reviewed and approved by the Government Designated Authority (GDA) Sheila Winston (978-318-8159; sheila.m.winston@nae02.usace.army.mil) and deemed acceptable for use on the project.

The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract, the penalties for noncompliance, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

The Contractor shall conduct a safety meeting at the project site on the first day of work, whenever a new activity or phase of work begins, or at least weekly during the progress of work. All safety meetings shall be documented (See Figure 5 for an example). The attached safety meeting form or a similar contractor-prepared form shall be used. Records of the safety briefings shall be submitted to the GDA weekly.

WEEKLY SAFETY MEETING

Date Held: ______________________

Time: __________________________

CONTRACTOR: ______________________ Contract No. DACW33-

PERSONNEL PRESENT (check): Contractor ____ Sub. ____ Government ____

SUBJECTS DISCUSSED (check items that were discussed during meeting):

USACE EM385-1-1 _____ (Specific sections: ______________________)
On-site Accident Prevention Plan (or Site Safety and Health Plan) _____
Individual protective equipment (steel-toed boots, safety glasses, etc..) _____
Prevention of slips/falls _____
Back injury/safe lifting techniques _____
Fire prevention _____
First aid _____
Tripping hazards _____
Equipment inspection and maintenance _____
Hoisting equipment, winch and crane safety _____
Ropes, hooks, chains, and slings _____
Water safety _____
Boat safety _____
HAZMAT, Toxic hazards, MSDS, respiratory, ventilation _____
Staging, ladders, concrete forms, safety nets, handrails ____
Hand tools, power tools, machinery, chain saws _____
Vehicle operation safety _____
Electrical grounding, temporary wiring, GFCI _____
Lockouts/safe clearance procedures _____
Welding, cutting _____
Excavation hazards/rescue _____
Loose rock/steep slopes _____
Explosives _____
Sanitation and waste disposal _____
Clean-up, trash _____

Other safety issues of concern specific to contract that was discussed during meeting:

All persons attending meeting the meeting must sign below or on the back of the form.

Contractor Representative Signature ________________________ Date: _______
CE Inspector/QA (if present at meeting) ________________________ Date: _________

Figure 5. Example of weekly safety meeting form.

6.2 Activity Hazard Assessment

An AHA shall be submitted for each major phase of work. A major phase of work is defined as an operation involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform the work. The analysis shall define all activities to be performed, identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on a phase of work until the AHA has been accepted by the GDA. A preparatory meeting shall be conducted by the contractor to discuss the AHA contents with all engaged in the activity. The preparatory meeting shall be conducted by the prime contractor and shall include all subcontractors and Government on-site representatives. The AHA shall be continuously reviewed and revised to address changing site conditions or operations as appropriate.

6.3 Accident Reporting

All accidents and near misses shall be investigated by the Contractor. All work-related recordable injuries, illnesses and property damage accidents (excluding on-the-road vehicle accidents), in which the property damage exceeds $2,000.00, shall be verbally reported to the GDA within 24 hours of the incident. Serious accidents as described in EM 385-1-1 Section 01.D.02 shall be immediately reported to the GDA. ENG Form 3394 shall be completed and submitted to the GDA within five working days of the incident.

The Contractor shall complete the "USACE Contractor Monthly Summary Record of Injuries/Illness and Work Hour Exposure" (for prime and its subcontractors) shown in Figure 6, and forward the completed form to the GDA no later than close of business on the 10th calendar day of the following month. The method of transmission by the prime contractor to the GDA shall be electronically.

USACE PRIME CONTRACTOR

Monthly Record of Work-Related Injuries/Illnesses & Exposure

US Army Corps of Engineers

Month ________

Year ________

USACE Command	
Contractor Name	
Contract Number	
Project Title	
City	State
USACE Office Overseeing Work:	

In accordance with the provisions of EM 385-1-1, Section 01 Program Management, Paragraph 01.D Accident Reporting and Recording, sub-paragraphs 01.D.05, you (the Prime Contractor) shall provide a monthly record of all exposure and accident experience incidental to the work (this includes exposure and accident experience of the Prime Contractor and its sub-contractor(s). As a minimum, these records shall include exposure work hours and a record of occupational injuries and illnesses that include the data elements listed below. Definitional criteria for each data element is found in 29 CFR Part 1904. If the maintenance of OSHA 300 Logs are required by OSHA, most of this information can be obtained from those logs. If data on log provided below is revised after it is submitted to USACE, Contractor shall provide a revised report to the GDA. You must complete the USACE ENG Form 3394, Report of Accident Investigation Report for all recordable accidents. If you're not sure whether a case is recordable, call your local Safety and Occupational Health Office for help.

Identify the person								Describe The Case		Classify the case										
(A)		(B1)	(B2)	(B3)	(C)	(D)	(E)	(F)	Using these categories, check ONLY the most serious result for each case:				Enter the number of days the injured or ill worker was:		Check the "injury" column or choose one type of illness: (M)					
Company Name	Prime or Sub (P or S)	Age	Gender	Date Employee Began Work on Job Covered by Contract	Job Title (e.g., Welder)	Date of Injury or onset of Illness (mo./day)	Where the event occurred (e.g. Loading dock north end)	Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	Death	Days away from work	Remained at work: Job transfer or restriction	Remained at work: Other record-able cases	On job transfer or restriction (days)	Away from work (days)	Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
									(G)	(H)	(I)	(J)	(K)	(L)	(1)	(2)	(3)	(4)	(5)	(6)
									0	0	0	0	0	0	0	0	0	0	0	0

For Government Use Only

TYPE OF WORK ACTIVITY (Choose One):			
Construction		Environmental Remed.	
Opn & Main.		Superfund	
Eng. Services		FUDS	
Dredging		IRP	
Rsch. & Dev.		FUSRAP	
Emerg. Opns.		Ordnance/Expl. Cleanup	
Other		Environmental Other	

Type of Contract (Choose One):	
Civil Works	
Military Programs	
Other	

Exposure Hours	
Month	
Year to Date	

Certification of Record	
Name of Person Submit. Record	
Signature	
Date	

Page __ of __

Figure 6. USACE Monthly Accident Reporting Form