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GUIDELINES AND BEST PRACTICES FOR CULTURAL RESOURCES INVESTIGATIONS IN CONNECTICUT STATE WATERS

PREPARED FOR

STATE HISTORIC PRESERVATION OFFICE
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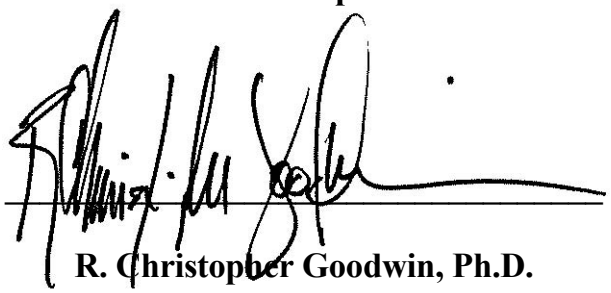
Guidelines and Best Practices for Cultural Resources Investigations in Connecticut State Waters

Final Report



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ABSTRACT

This report develops draft guidelines for submerged archaeological resources investigations in Connecticut coastal waters to direct and assist compliance efforts pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (Full Citation), and with Connecticut's counterpart statutes contained in CGS § 10-321q and CGS § 10-409. It also provides a comparative review of guidelines and permitting requirements for coastal states and federal agencies as a contextual backdrop and to underline best practices relevant to the development of Connecticut guidelines. The draft guidelines also draw heavily upon applied knowledge of the tools, techniques, and methodologies of contemporary geophysical and geotechnical survey as they apply to submerged cultural resources identification and evaluation. Technical guidance also is provided with reference to assessing the eligibility of submerged cultural resources for listing on the National Register of Historic Places.

This report specifically reviews the approaches that federal agencies (i.e., three districts of the United States Army Corps of Engineers and the Bureau of Ocean Energy Management) and 14 states have developed to control underwater archaeological work in their jurisdictions, to identify and evaluate submerged cultural resources, to consider effects to identified historic properties (*sensu* 336 CFR Part 800), and to implement treatment plans to avoid or mitigate adverse impacts to submerged cultural resources. The programs of the 14 states described herein represent different coastal regions of the United States, as well as differing approaches to submerged cultural resource management. The report notes the states' and agencies' varying approaches to submerged resources, as well as their strengths and weaknesses. Although most of the state programs reviewed in this document have very specific requirements for conducting underwater cultural resources investigations, only about half of these programs are overseen by professional maritime archaeology staff. In addition, while most states and federal agencies have permitting programs, permit requirements vary widely. Such variation exists both in terms of whether the governmental bodies have published guidelines regarding requirements for all phases of submerged resource investigations, and in specifications related to remote sensing equipment and methodologies such as survey track-line spacing. The approach provided here for the State of Connecticut to consider is flexible, so that the parameters of underwater archeological investigations can be readily established on a case-by-case basis in response to project applications. Finally, and as part of this review, relevant federal statutes and applicable National Park Service bulletins are reviewed to aid in integrity assessments of shipwrecks.

Acronyms and Abbreviations

A	
AAUS	American Academy of Underwater Scientists
ADCI	Association for Diving Contractors International
APE	Area of Potential Effect
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
B	
BOEM	Bureau of Ocean Energy Management
BUAR	Bureau of Underwater Archaeological Resources
C	
CA	California
CFR	Code of Federal Regulations
CT	Connecticut
CRIS	Cultural Resource Information System
*.csv	comma separated value
D	
DAHP	Department of Archaeology and Historic Preservation
*.dbf	database file
DCR	Division of Cultural Resources
DE	Delaware
DGPS	Differential Global Positioning System
DHEC	Department of Health and Environmental Control
DHP	Division for Historic Preservation
DHR	Division of Historical Resources
DNR	Department of Natural Resources
DP	Dynamic Positioning
E	
ENC	Electronic Navigation Charts
EPA	Environmental Protection Agency
F	
ft	feet
G	
GIS	Geographic Information System
GP	General Permit
Guide	*The Guide for Public Archeology in Wisconsin*
γ	gamma

H

HDD	Horizontal Directional Drilling
HDPE	high-density polyethylene
HI	Hawaii
Hz	hertz

K

kHz	kilohertz
km	Kilometers
km^2	Square kilometers

L

Louisiana	LA

M

m	meters
MA	Massachusetts
MD	Maryland
MET	Meteorological
MHC	Massachusetts Historical Commission
MHT	Maryland Historical Trust
MMAP	Maryland Maritime Archaeology Program

N

NAD	North American Datum
NAUI	National Association of Underwater Instructors
NAVD	North American Vertical Datum
NC	North Carolina
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NHRP	National Register of Historic Places
NJ	New Jersey
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRHP	National Register of Historic Places
nT	nano-Tesla
NTL	Notice to Lessees
NY	New York
NY SHPO	New York State Historic Preservation Office

O

OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
OPRD	Oregon Parks and Recreation Department
OREP	Office of Renewable Energy Programs
OSHA	Occupational Safety and Health Administration

P

PADI	Professional Association of Diving Instructors
PI	Principal Investigator
PNF	Project Notification Form

Q

QMA	Qualified Marine Archaeologist

R

RCG&A	R. Christopher Goodwin & Associates, Inc.
RI	Rhode Island
RIHPHC	Rhode Island Historical Preservation & Heritage Commission
ROV	Remote-Operated Vehicle

S

SC	South Carolina
SCIAA	South Carolina Institute of Archaeology and Anthropology
SCUBA	Self-Contained Underwater Breathing Apparatus
*.shp	shapefile
SHPO	State Historic Preservation Office
SOI	Secretary of the Interior
sq mi	square miles
SSI	Scuba Schools International

T

TAC	Texas Administrative Code
TBD	to be determined
THC	Texas Historical Commission
*.tif	tagged image format
*.txt	text file

U

UAB	Underwater Archaeology Branch
UHMWE	ultra-high molecular weight polyethylene pipes
U.S.	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOI	United States Department of the Interior

V

VA	Virginia

W

WAC	Washington Administrative Code

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Chapter I

Introduction

Introduction

By state law, the Connecticut State Historic Preservation Office (CT SHPO) is responsible for the protection of all significant archaeological resources located on state lands, in state waters, and in currently designated state archaeological preserves as well as traditional cultural properties (sacred sites). The responsibility of the CT SHPO extends to archaeological investigations, construction and demolition activities, and all other actions or activities that may endanger significant archaeological or sacred sites. Pursuant to Section 106 of the National Historic Preservation Act and the Abandoned Shipwreck Act of 1987, shipwrecks fall variously under the jurisdiction of either the state or federal governments. The CT SHPO's permitting procedures are currently covered under Connecticut General Statutes, Section 10-386, which ensure the protection of cultural resources in conjunction with Connecticut General Statutes Section 10-382 (Connecticut Commission on Culture & Tourism 2000; Appendix 1).

Because submerged archaeological sites located in Connecticut waters fall under the protection and purview of the CT SHPO, explicit guidelines pertaining to the investigation of submerged sites including shipwrecks (i.e., "historic properties," *sensu* 36 CFR Part 800), and permit requirements can help to guide and ultimately ensure proper and professional consideration of effects of any project that may physically impact cultural resources on and in state water bottoms. Consideration of potential physical effects to significant archaeological resources within state water bottoms presupposes the prior acquisition of a thorough cultural resources inventory of a project's Area of Potential Effect (APE). The APE is defined as the "geographic area or areas within which an undertaking may directly or indirectly cause changes in the character of or use of historic properties, if any such properties exist" (36 CFR § 800.16(d)). In the marine environment, such inventories are accomplished using an array of remote sensing, also known as geophysical survey, equipment to collect the appropriate data for identification and evaluation of submerged resources. Although Connecticut General Statutes, Sections 10-382 and 10-386, provide permitting regulations that aim to protect and preserve significant archaeological or sacred sites, projects conducted in marine environments come with unique methodological, logistical, and interpretive challenges that argue strongly for formalized and consistent guidance, including standardized survey methodologies and application of the appropriate geophysical instrumentation, to assure proper consideration of potential effects to submerged resources before bottom-disturbing activities damage or destroy significant resources.

This report provides a draft set of guidelines for submerged archaeological resources investigations within Connecticut state waters. It also provides a comparative review of guidelines and permitting requirements for select states and federal agencies chosen to illustrate the nature of contemporary agency approaches for submerged cultural resource management and to inform best practices for compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. In addition, this report provides guidance in applying the National Register of Historic Places (NRHP) Criteria for Evaluation (36 CFR Part 64) to submerged archaeological resources.

Chapter II

Comparative Review of Agency Regulations for Submerged Archaeological Resource Assessments

Introduction

This chapter provides a synoptic overview of relevant state and federal underwater archaeological guidelines, regulations, permitting requirements, and statutes. The state and federal agencies discussed below have developed, with varying degrees of specificity, management guidelines for submerged cultural resources investigations within their jurisdictional waters. Although some state historic preservation offices (SHPO) discussed below do not employ specifically qualified marine archaeologists to review submerged cultural resources investigations, they nevertheless have promulgated formal guidance on the prosecution of such investigations to help assure the quality of marine archaeological work. Other states either cooperate with other jurisdictions or routinely impose standards borrowed from federal agencies. The programs discussed in this chapter illustrate the permitting processes for submerged cultural resource investigations, noting how they differ from state-to-state and between federal agencies. The guidelines of the federal Bureau of Ocean Energy Management (BOEM) are among those reviewed here, since they are directly germane and because several states either have adopted BOEM guidance or give them de facto precedence when the state does not have a maritime-trained staff and/or state guidelines are not well-developed. These reviews provide context for the development of draft guidelines pertaining to submerged cultural resource investigations in Connecticut state waters, and, as will be seen, they point to contemporary "best practices" applied by SHPOs and federal agencies across the country, even if there is no consensus approach to marine archaeological resources.

Federal Regulations

Federal regulatory programs provide jurisdiction over and administration of oil/gas and renewable energy projects on offshore federal lands. The Outer Continental Shelf (OCS) Lands Act (OCSLA) of 1953 (as amended) grants the BOEM (CFR Title 30, Chapter V, Subpart B-Offshore) lead enforcement of laws and regulations governing offshore leasing. Likewise, the Energy Policy Act of 2005, an amendment to OCSLA, grants BOEM lead management authority for marine renewable energy projects on Federal offshore waters. The Oil Pollution Act of 1990 (33 U.S.C. 2701-2761) granted the Secretary of the Interior (SOI) authority to impose penalties on Outer Continental Shelf (OCS) facilities including pipelines in federal waters, but specifically excepted deepwater ports. The SOI in turn delegated that authority to BOEM. As will be seen, BOEM's leadership role on the OCS has shaped at least one state-level program, that of New York, and influenced other states. Furthermore, both state and other federal agencies may seek assistance from BOEM to ensure compliance with the National Environmental Policy Act (NEPA) of 1969.

The United States Army Corps of Engineers (USACE) has regulated activities in navigable waterways of the United States (U.S.) since passage of the Rivers & Harbors Act of 1899. The reach of the USACE was extended by the passage of the Clean Water Act in 1972: Section 404 of the Clean Water Act is the most commonly used authority for providing USACE with federal jurisdiction in tidal and non-tidal waters, including wetlands (where wetlands extend beyond the high tide line), rivers, and streams, for the discharge of dredged or fill materials. Section 10 further

provides the USACE with regulatory jurisdiction in tidal wetlands and the territorial seas for all structures and work in navigable waterways. USACE also can issue General Permits (GPs) for categories of activities that are similar in nature to one another and have minimal impacts on the natural and cultural environment. Nationwide permits (NWPs) are the most common and least complex form of GP authorization. That program allows economic development activities to move forward while meeting environmental protection requirements along with consideration of effects to historic properties. Finally, both BOEM and USACE provide government-to-government consultation with federally recognized Tribes on projects that have the potential to affect properties of traditional cultural importance, including those on drowned ancestral lands.

Bureau of Ocean Energy Management Office of Renewable Energy Programs

BOEM's Office of Renewable Energy Programs (OREP), requires applicants to submit detailed plans of their proposed activities for review prior to approving the installation of any renewable energy facility, structure, or cable on the Outer Continental Shelf (OCS). Currently, BOEM has mapped OCS leases for commercial wind energy projects in Massachusetts (MA), Rhode Island (RI), New York (NY), New Jersey (NJ), Delaware (DE), Maryland (MD), Virginia (VA), and North Carolina (NC); additional planning areas include South Carolina (SC), California (CA), and Hawaii (HI). The RI wind energy area is less than 56 km (35 miles) off the Connecticut (CT) coast, and offshore energy produced in federal leases off of Massachusetts and New York, the other adjacent states, also is likely to be introduced by cables to Connecticut across state jurisdictional water bottoms.

The latest BOEM guidelines (March 2017) were developed to provide applicants with basic guidance for formulating and implementing geophysical surveys to acquire archaeological information. Because those guidelines are specific to renewable energy activities, they may not comply with all archaeological or NEPA conditions of an applicant's lease. BOEM recommends that all lessees and applicants coordinate their proposed activities through the submission of a survey plan and by participation in a pre-survey meeting. BOEM suggests that plans include high-resolution geophysical survey data acquisition and interpretation, and geotechnical testing, so that the necessary data to identify archaeological sites on the OCS are acquired. BOEM specifies that geophysical survey techniques should include primary line-spacing not to exceed 30 m (100 ft) for gradiometer (magnetometer) and sub-bottom profiler surveys, with tie lines at 500 m (1,640 ft) intervals, or tighter. Side scan sonar resolution should be 500 kilohertz (kHz) or greater, and able to resolve small targets measuring 0.5 m (1.6 ft) in length at maximum range while providing 200 per cent bottom coverage. BOEM encourages applicants to coordinate its geotechnical testing with its Qualified Maritime Archaeologist (QMA), to ground-truth the sub-bottom data and inform archaeological interpretation. Many state and federal agencies have adopted that guidance or given it de facto precedence when state guidelines either are not as well developed or lack such specificity.

<u>Gulf of Mexico OCS Regions</u>

BOEM provides specific guidance for conducting archaeological resources surveys through the issuance of a Notice to Lessees and Operators (NTL) for oil, gas, and sulfur leases and pipeline right-of-way holders in the Gulf of Mexico OCS region. NTL 2011-Joint-G01 and NTL 2006-G07 (BOEM 2006 and 2011) provide a list of Archaeological High Probability Lease Blocks that require archaeological resource surveys and which define the required survey line-spacing (50 or 300 m [164 or 984 ft]) for each block. To do so, BOEM developed predictive models that define the OCS areas with the highest potential for archaeological resources (drowned terrestrial prehistoric and historic sites, including shipwrecks). The OCS lease areas designated as having high archaeological potential by BOEM are revised periodically on the basis of new archaeological discoveries. These NTLs do not apply to lease blocks located in the Atlantic OCS.

One current Geophysical and Geotechnical Programmatic Environmental Impact Statement area of interest extends from DE to FL. However,

BOEM currently has no programmatic NEPA coverage for permitting geophysical and geotechnical activities in Atlantic OCS waters.

The U.S. Army Corps of Engineers

USACE is divided into eight divisions and 38 districts, defined through application of watershed boundaries. The primary laws and regulations that establish the parameters for the USACE's cultural resources program include Appendix C. The latter is USACE's internal counterpart regulation to the 36 CFR Part 800 regulations implementing the NHPA; the Archaeological Resources Protection Act of 1979 (Pub. L. 96–95 as amended, 93 Stat. 721, codified at 16 U.S.C. §§ 470aa–470mm); the Native American Graves Protection and Repatriation Act (Pub. L. 101-601, 25 U.S.C. 3001 et seq., 104 Stat. 3048); and NEPA. USACE's cultural resources program is implemented when a proposed project on leased or licensed federal land, or that requires a federal permit under Section 404 of the Clean Water Act, triggers an "undertaking" under Section 106 of the NHPA. Such projects typically are managed by the District Archeologist.

USACE's mandate includes governance over much of the United States' coastal and navigable waters. Furthermore, and as a federal agency involved in the maintenance of aquatic transportation, USACE is involved in a wide range of activities that include dredging of channels, harbors, and waterways, as well as leasing offshore areas for mineral extraction. USACE districts with navigable waterways at a minimum review contractors' projects for NHPA-related effects, as well as proposals for NHPA-related work. But USACE does not have a unified policy, and instead each district has formulated approaches for cultural resources studies, some consulting with BOEM and state agencies to develop scopes of work, and others setting minimum standards of their own.

USACE, New York District

USACE's New York District does not publish guidelines for underwater projects (Lynn Rakos, personal communication, 2017). Instead, the New York District will develop scopes of work based on current standards and best practices through consultation with BOEM and the NY SHPO. The New York District will review contractor's survey plans and proposals to ensure that they meet project requirements.

USACE, Philadelphia District

USACE's Philadelphia District also does not publish guidelines for underwater projects. Instead, the Philadelphia District develops project specific scopes of work frequently based on the current published BOEM guidelines (Nichole Minnichback personal communication, 2017).

USACE, Mobile District

USACE's Mobile District has developed minimum guidelines for Phase I marine archaeological projects. Phase I surveys should include at minimum a high-resolution (≥600 kHz) side scan sonar and a marine magnetometer towed at a line-spacing increment (not to exceed 50 m [164 ft]) to achieve 200 percent bottom coverage. Subbottom CHIRP profiler data should be collected at a range of 2-5 kHz at the low end, and 16-22 kHz at the upper end. The data collected must be georeferenced using a Differential Global Positioning System (DGPS). The Mobile District reviews projects on a case-by-case basis.

Overview of Underwater Archaeology State Programs

Coastal states and U.S. territories (i.e., American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands) provide guidelines for conducting submerged cultural resource investigations.[11] Several states, such as Massachusetts, Maryland, North Carolina, South Carolina, Florida, Wisconsin, Michigan, and Texas have designated SHPO program offices and specialist personnel that manage submerged cultural resources. Other state SHPO offices with such purviews manage submerged cultural resources without a maritime archaeologist. Several states without a designated maritime archeologist maintain guidelines for conducting maritime archaeological projects (RI and DE), while other states (e.g., NY) draw on

1 U.S. territories' approaches to managing underwater cultural resources are not reviewed herein due to their physical distance and to geographic, environmental, and historical dissimilarities to Connecticut.

or refer to the standards established by the Federal BOEM (Table VI-1). The following discussion reviews relevant state programs and their guidelines for managing submerged archaeological resources. These states were chosen to capture the range of variability in state programs, and to highlight different approaches applied to the management and permitting of underwater archaeological investigations. In addition to the geographically close New England states, several of the states discussed below share similar environments to those of Connecticut; others are highlighted to show differences in approaches to managing submerged cultural resources across coastal regions of the United States. The characteristics of agency approaches to submerged cultural resource management are summarized in Table II-I, below. These synoptic overviews provide a context for the efforts of the CT SHPO to formulate guidelines for the management of submerged cultural resources on and in state water bottoms. Following the specific agency reviews, popular and practices gleaned from the various approaches are discussed.

Atlantic Region

Most of the states in the Atlantic Region have established guidelines for the management of submerged cultural resources on state water bottoms. These guidelines uniformly have been promulgated and are administered under the auspices of the respective SHPOs. However, not all Atlantic states have published guidelines, and others refer directly to published BOEM guidelines for survey specifications. The pertinent guidelines, preservation practices, and permitting requirements for submerged cultural resource studies from the Atlantic Region are summarized below.

Massachusetts

Massachusetts is one of several states with a specific department devoted to underwater archaeological activity within its state waters. The Massachusetts Historical Commission (MHC) is the SHPO, as well as the office of the State Archaeologist. MHC conducts reviews for projects that require funding, licenses, or permits from state or federal agencies, and identifies the potential impacts of undertakings to historic and archaeological properties. MHC's review is initiated once the project proponent submits a completed Project Notification Form (PNF) required under 950CMR71.00 to MHC by mail or courier (e-mail is not accepted); there is no fee for MHC review. Upon receipt of a PNF, MHC will complete its review and submit its comments to project proponents in writing within 30 days. If MHC's review determines that additional information is needed to assess the likelihood that historic or archaeological properties will be affected by the proposed project, the project proponent will be required to obtain a State Archaeological Permit; permit regulations are published in 950 CMR 70. The State Archaeologist reviews the permit application to determine whether it is complete and adequate.

In the marine environment, MHC is aided by the Massachusetts Board of Underwater Archaeological Resources (BUAR), which is trusted with the protection and oversight of the Commonwealth's underwater cultural heritage. BUAR was established in 1973; its mission statement affirms that, "As the official steward of the Commonwealth's underwater heritage, BUAR promotes and protects the public's interests in these resources for recreational, economic, environmental, and historical purposes" (BUAR 2018). Underwater archaeological sites that fall under the protection of BUAR include shipwrecks, submerged Native American sites, wharves, and aircraft. BUAR is charged with protecting the state's submerged cultural resources under Massachusetts General Laws.

Both BUAR (312 CMR 2), and Massachusetts General Law (C. 91, s. 63, as amended) provide rules and regulations that establish three classes of archaeological permits pertaining to underwater archaeological research activities: Reconnaissance, Excavation and Special Use (Massachusetts BUAR 2008). Reconnaissance Permits allow the holder sole use of an area to identify resources through nondestructive methods. Excavation Permits allow the holder the sole use of an area to uncover or excavate archaeological resources. Special Use Permits allow qualified archaeologists to conduct work for environmental review, public planning, and scientific research.

Table II-1. Tabulated overview of agency regulations

State or Agency[1]	Permit Requirement	State Maritime Historian/ Archaeologist	Professional Qualifications for the Principal Investigator		Published Methodology			Coordination Required	Max Line Spacing (M)[2]	Required Equipment Array	
			Specific QMA	SOI[1,]	Phase I	Phase II	Phase III			Standard Equipment Array[3]	Sub-Bottom
MA[1]	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y
RI	Y	N	Y	Y	Y	N	N	Y	TBD	TBD	TBD
NY[2]	N	N	N	Y	N	N	N	Y	15	Y	Y
DE[1]	Y	N	Y	Y	Y	N	N	Y	15	Y	TBD
MD	N	Y	N	Y	N	N	N	Y	15	Y	TBD
VA	Y	N	N	Y	Y	N	N	Y	TBD	NA	NA
NC	Y	Y	N	Y	N	N	N	Y	15	Y	TBD
SC	Y	Y	Y	N	N	N	N	Y	20	Y	TBD
FL	Y	Y	N	Y	Y	Y	N	Y	30	Y	Y
LA	N	N	N	Y	N	N	N	Y	20-30	Y	Y
TX	Y	Y	Y	N	Y	N	N	Y	20	Y	TBD
CA	Y	N	N	Y	N	N	N	Y	TBD	TBD	TBD
OR	Y	N	Y	Y	Y	Y	Y	Y	TBD	Y	Y
WA	N	N	N	Y	N	N	N	Y	TBD	TBD	TBD
WI	Y	Y	N	Y	Y	Y	Y	Y	15	Y	Y
MI	Y	Y	N	Y	N	N	N	Y	TBD	Y	N
BOEM	N	-	N	Y	Y	N	N	Y	30	Y	Y
New York District, USACE	Y	-	N	N	N	N	N	Y	N	N	N
Philadelphia District, USACE	Y	-	N	N	N	N	N	Y	30	Y	Y
Mobile District, USACE	Y	-	N	N	Y	N	N	Y	50	Y	Y

[1]MA may require proponents to obtain permits from the MHC and/or BUAR; the Philadelphia District, USAE, refers to BOEM on a case by case basis
[2]To be determined (TBD) on a case-by-case basis
[3]Standard Equipment Array refers to side scan sonar and magnetometer

Applicants must provide extensive information including the project description, research design, background research, artifact conservation program, work plan, schedule, budget, personnel qualifications, and public-benefit plans. Applications are reviewed at regular meetings of BUAR. Based on BUAR's findings, the applicant will be provided a permit or receive written notification and an explanation that it has been denied. The permit holder is required to provide an annual report of project activities to the Board, and a full report upon project completion.

In June 2018, BUAR published policy guidance on underwater archaeological investigations (Massachusetts BUAR 2018). The methods are intended to establish the minimally acceptable standards for underwater archeological investigations. For Phase I submerged cultural resources projects, BUAR provides general requirements for geophysical remote sensing survey, including the collection of magnetometer, side scan sonar, sub-bottom profiler, and recommended swath bathymetry data. BUAR also provides guidance for visual survey and documentation of the project area using diving, remote operated vehicles, and submarine inspections.

Rhode Island

Rhode Island has published guidelines for submerged cultural resource surveys. However, Rhode Island does not have a department or archaeologist devoted to maritime cultural heritage. The Rhode Island Historical Preservation & Heritage Commission (RIHPHC) administers historic preservation and planning initiatives under the Antiquities Act (General Laws of Rhode Island 42-45.1) and the Abandoned Shipwreck Act (Public Law 100-298). RIHPHC oversees and regulates all archaeological activity on state lands, including state water bottoms. RIHPHC issues permits for all archaeological projects that require review in accordance with federal and state regulations (e.g., 36 CFR 800, RIHPHC's Procedures for Registration and Protection of Historic Properties, the Coastal Resources Management Plan). RIHPHC may impose special conditions (i.e., level of effort, methodology, etc.) on permits as circumstances warrant. RIHPHC will impose the Native American Special Condition on all permits involving pre-Contact archaeology, and will send copies of the permit application to all federally recognized Tribes that have identified themselves as interested parties.

For Phase I submerged cultural resources projects, RIHPHC generally requires a remote sensing survey methodology that includes collecting marine magnetometer, side scan sonar, and shallow seismic (i.e., CHIRP sub-bottom) data. A research design predicts what types of archaeological resources are expected within a project area, which in turn informs the development of the remote sensing survey plan (i.e., methods and instrumentation). Therefore, background research must be completed prior to submission of the permit application. Permit issuance may take up to 30 days (RIHPHC 2017).

RIHPHC recommends early consultation through submittal of a work plan. This practice is similar to many other states. Section 106 work is not allowed prior to RIHPHC's issuance of a permit. Phase II and III projects are reviewed on a case-by-case basis. While the guidelines for conducting submerged archeological surveys within Rhode Island state waters are published, the Rhode Island SHPO does not have an archaeologist or historian on staff dedicated to overseeing maritime projects.

New York

The State of New York enacted Section 233 of the Education Law in 1958 to help protect public cultural and geological resources. Education Law §233 states that "permits are required for any activity that will "appropriate, excavate, injure, or destroy any object of archaeological or paleontological interest, situated on or under lands owned by the State of New York." In New York, multiple state agencies (NY State Department of Environmental Conservation, Division of Marine Resources; NY Department of State; NY Parks and Recreation, Historic Preservation's Division for Historic Preservation [DHP], NY Office of General Services, and the NY Public Service Commission) work together to administer, protect, conserve, and manage underwater archaeological sites and submerged heritage preserves. The State Museum is custodian of underwater archaeological sites on state water bot-

toms; it issues permits in conjunction with other state agencies for research at sites on that land. Representatives from each of these agencies sit on an ad hoc committee for underwater resources. The committee serves as a clearinghouse for shipwreck issues, and as a forum for coordinating agency responses and policies.

DHP, also known as the New York State Historic Preservation Office (NY SHPO), handles its project consultations using the Cultural Resource Information System (CRIS) (DHP 2017, 2018), available at https://cris.parks.ny.gov. CRIS is an advanced geographic information system (GIS) designed as an interactive portal for agencies, municipalities, and the public who use or require consultation with the NY SHPO on historic preservation programs, Section 106, the New York State Historic Preservation Act (Section 14.09 State Regulations), or the State Environmental Quality Review Act. The project archaeologist and any others identified as points of contact will receive an email notification when the submission is accepted or if more information is necessary to process the submission.

New York does not have a specific publication to guide submerged cultural resources investigations. Rather, it follows the guidelines of either BOEM or USACE on a case-by-case basis (Daria Merwin, personal communication, 2016). Project plans submitted through CRIS are reviewed on a case-by-case basis. The NY SHPO currently recommends 15 m (50 ft) line-spacing in state waters using a remote sensing survey array to collect magnetometer, side scan sonar, and sub-bottom profiler data throughout the APE for direct effects. Side scan sonar data should be collected in a manner that allows complete coverage of the survey area including overlapping coverage of the adjacent nadir, and the resolution should be sufficient to resolve small objects. In addition, the NY SHPO requires cultural resource clearance of geotechnical locations prior to commencement of sampling activities.

Delaware

The State of Delaware (2017) administers protection of archaeological resources under the Delaware Code (Title 7, Chapter 53, Subpart II, §5303-5316). The Delaware Division of Historical and Cultural Affairs (DE SHPO) issues a Delaware Antiquities Act Permit for archaeological investigations on state lands under the authority of the Delaware Code (State of Delaware 2017: §5309). The DE SHPO, with the approval of the Department of State, may formulate and adopt such rules, regulations, standards, and guidelines as it deems necessary for the effective execution and regulation of archaeological resources situated on state-owned or state-controlled lands, including state water bottoms. In 2015, the DE SHPO published updated archaeological survey guidance, which is available online (Delaware SHPO 2015). That document directs that discussions on underwater archaeological surveys and testing should be conducted with the DE SHPO staff in advance of field investigations. In addition, the guidelines (Delaware SHPO 2015:14) direct attention to BOEM (Gulf of Mexico) guidelines (NTL). For marine work, the DE SHPO typically consults with the USACE's New England District to ensure that the proposed methods are sufficient to meet the Secretary of the Interior's (SOI) Standards and NEPA review.

For projects that require diving, the DE SHPO guidelines (2015:15) reference safety standards promulgated by the Professional Association of Diving Instructors (PADI), the National Association of Underwater Instructors (NAUI), Scuba Schools International (SSI), and other recreational diving organizations. The recreational standards do not comport to the United States Department of Labor, Occupational Safety and Health Administration's (OSHA's) commercial diving operations (OSHA 2017), USACE (2014) health and safety requirements, or industry best practices for commercial diving (ADCI 2016).

For Phase I projects, the DE SHPO typically requires 15 m (50 ft) survey line-spacing with tie lines. The standard survey array should consist of a side scan sonar system and marine magnetometer. Sub-bottom profiler systems are only required where the SHPO has determined a need, based on existing geomorphological data. Phase II and Phase III projects are infrequent, and therefore handled on a case-by-case basis (Craig Lukezic, personal communication, 2017). While the DE SHPO has preferences for submerged archaeological methodologies, they prefer to rely

on consultation to develop underwater projects on a case-by-case basis.

Maryland

Maryland's submerged cultural resources are administered under the Maryland Historical Trust Act of 1985 as amended, State Finance and Procurement Article §§ 5A- 325 and 5A-326 of the Annotated Code of Maryland. The Maryland Maritime Archaeology Program (MMAP), which was created in 1988, resides within the Maryland Department of Planning, Maryland Historical Trust (MHT).The MMAP was created and developed as a response to the Abandoned Shipwreck Act of 1987 that gave states with established management programs the title and ownership to significant historic shipwreck remains located within state waters, excluding sunken military craft owned by the United States government, as well as foreign sunken military craft that lie within U.S. waters, which are protected under the Sunken Military Craft Act (Pub. L. 108–375, div. A, title XIV, Oct. 28, 2004). Since its creation, the MMAP has included within its purview the protection of prehistoric sites as well as historic structures such as buildings, bridges, and wharf remains. MHT may issue permits (Maryland Department of Planning, MHT 2018) to conduct archaeological investigations on state-owned or state-controlled submerged lands. Survey requirements are determined through consultation and coordination with MHT (Troy Nowak, personal communication, 2016), and through submission of a project review form that provides a project description, a project area map, a scope of work, construction drawings, photographs showing the project site, and a brief description of past and present use.

MHT recommends early consultation; it will comment on proposed research methods on a case-by-case basis. The applicant should submit both a survey plan and a work plan. It is recommended that no work pursuant to Section 106 of NHPA is undertaken prior to consultation. MHT coordinates directly with the permitting agency, the applicant, and the applicant's archaeologist regarding methods and reporting for reconnaissance and identification surveys.

According to MHT's website, permits to conduct archaeology on state property are not required to "inspect, study, explore, photograph, measure, record, conduct a reconnaissance survey, or otherwise use and enjoy a submerged archaeological historic property if the use or activity does not:

- Involve excavation, destruction, or substantive injury of the historic property or its immediate environment;
- Endanger other persons or property; or
- Violate other regulations or provisions of federal, State, or local law" (Maryland Department of Planning, MHT 2018).

Survey particulars depend on project location, the type of undertaking proposed, and the types of resources that may be encountered. Generally, MHT recommends that magnetometer surveys adhere to a maximum of 15 m (50 ft) line-spacing, but tighter line-spacing in state waters may be recommended depending on a variety of factors. Side scan sonar data should be collected in a manner that allows complete coverage of the survey area, including overlapping coverage of the nadir. Resolution should be controlled so that small objects can be identified. Geotechnical clearance may be required depending on the project. Phase II and III projects are reviewed on a case-by-case basis.

North Carolina

North Carolina's Office of State Archaeology in the Division of Historical Resources (DHR) administers the state's archaeological program. North Carolina's Department of Cultural Resources (DCR) Underwater Archaeology Branch (UAB) oversees the state's submerged cultural resources and the protection and preservation of the approximately 5,000 shipwrecks reported within its state waters. UAB was established within the Office of State Archaeology in 1962 to identify, understand, protect, and manage the state's submerged cultural resources. In recent years UAB has also developed the state's first Heritage Dive Site.

Under North Carolina Statutory Authority, General Statutes 121-25, the Department of Cul-

tural Resources may issue a permit to conduct exploration, recovery, or salvage of a derelict shipwreck or archaeological artifacts (North Carolina DHR 1989). For submerged cultural resources, permit applications are submitted to UAB. It determines the terms and conditions, including objective, methods, techniques, etc., on a case-by-case basis through the permitting process (North Carolina DHR 1989; North Carolina Office of State Archaeology, UAB 2017; Chris Southerly, personal communication, 2016). Permit issuance or comments may take up to 30 days, and may require a permit fee (General Statute 121-25). The applicant must provide a description of the project location, a map, and a scope of work based on a preliminary assessment of the physical and cultural history of the project area.

Like most state underwater archaeology units, UAB recommends consultation prior to conducting underwater archaeological surveys within state waters. While a permit is required for any project aimed at searching for a historic vessel, no permit is required for non-disturbance Section 106 compliance surveys; however, consultation with DHR is required prior to the commencement of survey. Survey requirements include the use of side scan sonar and magnetometer with 15 m (50 ft) line-spacing. The inclusion of a sub-bottom profiler is determined on a case-by-case basis through consultation. The Division of Coastal Management must be consulted prior to conducting any geotechnical operations or bottom disturbance of any kind. All Phase II and III projects are considered on a case-by-case basis following the review of a Phase I survey report (John Morris, personal communication, 2017).

South Carolina

South Carolina has a state-run program devoted to submerged cultural resources and maritime research. The state's maritime cultural heritage is overseen by the Maritime Research Division (MRD) of the South Carolina Institute of Archaeology and Anthropology (SCIAA). The responsibilities of MRD include creating and maintaining a research database of state underwater archaeological sites, and overseeing and implementing the South Carolina Underwater Antiquities Act of 1991 (amended 2001). The South Carolina Code of Laws (Section 54-7-610 et. seq.) delegates responsibility for managing and protecting the state's underwater archaeological resources to SCIAA on behalf of the State Budget and Control Board.

SCIAA acts in concert with SC SHPO to ensure adequacy of underwater archaeological research and reports carried on in State waters by public or private organizations, individuals, or any other entities conducting underwater archaeological field and/or laboratory investigations at prehistoric and historic sites. This initiative also provides opportunities for public interaction through education and outreach programs (SCIAA 2018).

The South Carolina Coastal Zone Management Act of 1979, (Section 48-39-150(6)), states that the South Carolina Department of Health and Environmental Control's (DHEC) Office of Ocean and Coastal Resource Management must consider "the extent to which development could affect...irreplaceable historic and archaeological sites of South Carolina's coastal zone" (South Carolina DHEC 1979: IV-23).

In accordance with provisions specified by the South Carolina Code of laws (Article 5), the South Carolina Underwater Antiquities Act of 1991, Section 54-7-610 to Section 54-7-850, SCIAA may issue or revoke licenses for excavation or disturbance of submerged archaeological properties; however, a permit is not required to "inspect, study, explore, photograph, measure, etc. or otherwise use and enjoy such property," if the project does not include excavation or any substantive injury to the site or its environment. South Carolina can issue three types of licenses: a hobby diver license, an intensive survey license, and a data recovery license. These permits have fees associated with them. The applicant must consult with SCIAA to acquire a license. South Carolina requires that the Project Archaeologist spend at least 50 percent of the allocated project field time working in the field (SCIAA 2005).

SCIAA recommends consultation prior to conducting any submerged cultural resource surveys and will review the proposed research methods on a case-by-case basis. SCIAA coordinates directly with the permitting agency, the applicant, and the applicant's archaeologists concerning

survey methods and report guidelines for all projects requiring compliance with state and federal preservation laws.

SCIAA recommends that all remote sensing surveys be conducted using a magnetometer and side scan sonar with 20 m (65 ft) line-spacing. The inclusion of a sub-bottom profiler for compliance surveys is considered on a case-by-case basis. South Carolina, unlike many states, does not categorize its bottomlands into high-, medium-, or low-probability areas. Any recommended changes to the survey equipment array or line-spacing is to be based on historical research. All Phase II and III projects are reviewed and considered on a case-by-case basis by the SCIAA (James Spirek, personal communication, 2017).

To its credit, SCIAA has not only promulgated written guidelines for conducting submerged cultural resource investigations, but it also has focused heavily on maritime research and public outreach.

Florida

Florida possesses one of the longest coastlines of any U.S. state, and borders both the Atlantic Ocean and the Gulf of Mexico. The state has a very rich maritime history that encompasses a huge variety of resources. These range from prehistoric and proto-historic dugout canoes, to ships of exploration, to modern commercial ships. Florida exerts its jurisdiction over cultural resources to waters extending three nautical miles into the Atlantic Ocean and 3 leagues (10 miles [16 km]) into the Gulf of Mexico.

Florida's antiquities laws (Florida Administrative Code, Title XVIII [Public Lands and Property], Chapter 267 [Historical Resources]) and administrative rules (Florida Administrative Code, Chapters 1A-31 and 1A-32) govern the use of publicly owned archaeological and historical resources located on state-owned property, including submerged bottomlands. Administered by the Florida Division of Historical Resources (DHR), the antiquities law establishes programs and policies to encourage preservation of historic resources for the public benefit. State-owned submerged resources are those located on the bottom of navigable rivers, streams, lakes, bays, and offshore to the Nine Nautical Mile limit in the Gulf of Mexico, and to the Three Nautical Mile limit in the Atlantic.

DHR preservation program currently identifies two types of permits that are issued to authorize maritime archaeological work: Exploration Permits, and Recovery Permits (Florida Administrative Code, Chapters 1A-31 and 1A-32; Florida DHR 2006; 2009). The DHR's Exploration Permit (Rule No. 1A-31) may be granted to individuals or companies for the survey and recovery of submerged cultural resources offshore in state waters. Exploration and Salvage Permits are issued for historic shipwreck sites. The shipwreck site must be documented under an exploration permit before a recovery permit can be applied for (Rule 1A-31). The DHR may take up to 90 days after receipt of an application to complete its review. Permits may be modified, suspended, or revoked by the DHR at any time.

DHR may issue a permit for Archaeological Research (Rule 1A-32) to survey and excavate in state waters by accredited institutions (i.e., museums, universities, non-profits, etc.) that "permanently possess a professional archaeological staff who meet or, in the judgment of the State Archaeologist, are capable of meeting" the SOI's Professional Qualifications Standards for archaeology (Florida DHR 2006).

According to DHR's Performance Standards for Submerged Remote Sensing Surveys (Florida DHR 2001), all initial surveys must include the use of a marine magnetometer, side scan sonar, sub-bottom profiler, depth finder unit, and global positioning system (GPS). All survey equipment should be integrated into a system capable of correlating all remote sensing data sets (Florida DHR 2001). DHR requires that reconnaissance surveys not exceed a line-spacing of 50 m (164 ft) in offshore and inshore waters deeper than 30 m / 100 ft of seawater (fsw). If the magnetic data reveal any spatial patterns (i.e., clusters of anomalies) during survey, a tighter line-spacing should be employed to determine the character and nature of the anomalies. DHR performance standards do not stipulate recording or towing standards for the marine magnetometer or the required resolution of the side scan sonar. All Phase II and III projects are reviewed and considered on a case-by-case basis (Florida DHR 2001). DHR, like

many state programs, categorizes its state water bottoms into high-, medium-, or low-probability areas.

Florida law allows salvage operations by issuing exploration and recovery permits under strict conditions.

Gulf of Mexico Region

The Gulf of Mexico is one of the more active areas in the country for projects, i.e., "undertakings" regulated pursuant to the NHPA. Projects are especially frequent in the region due to its strong modern-day commercial sector for offshore oil and gas, as well as the long-term implementation and management of coastal restoration projects, particularly since the Deepwater Horizon oil spill in 2010. The permitting processes and approaches to submerged cultural resources in Louisiana and Texas state water bottoms are reviewed below.

Louisiana

The Louisiana Department of Culture, Recreation and Tourism's Office of Cultural Development is the location of the State Historic Preservation Office (LA SHPO). Specifically, the Assistant Secretary of the Office of Cultural Development serves as the State Historic Preservation Officer. Two offices under the LA SHPO deal with Section 106 responsibilities on a joint basis: the Division of Archaeology (DOA) and the Division of Historic Preservation (DHP).

To assist the Section 106 review, DOA developed Louisiana's Cultural Resources web-based geographic information system (GIS), which contains information on standing structures and archaeological sites. The standing structure data are publicly available through that website; only approved agencies and cultural resource professionals have access to the protected archaeological information.

DOA currently does not have published standards for underwater archaeological surveys. Therefore, investigators must contact DOA for guidance. In January 2018 DOA requested comments from cultural resources professionals on proposed (draft) Fieldwork Guidelines for Cultural Resources Investigations (Louisiana DOA 2018). The draft guidelines contain a section on Marine Phase I Survey, which establishes professional qualifications and basic methods but does not provide detailed standards. However, DOA will accept "marine survey standards…promulgated" by BOEM. The draft methods require 30 m (100 ft) track-line spacing, except in waters less than 10 m (33 ft) deep, where 20 m (65 ft) line-spacing is recommended. The guidelines encourage consultation with the agency prior to commencing fieldwork to determine the appropriate survey methods.

Texas

Texas extends its jurisdiction 16.6 km (10.35 miles) out into the Gulf of Mexico and has developed a rigorous permitting process for conducting submerged archaeological studies within state waters. The Antiquities Code of Texas (Texas Government Code, Chapter 442), enacted in 1969, grants responsibility to protect archaeological and historic sites on state and local public property to the Texas Historical Commission (THC). The Texas Administrative Code (TAC), Title 13 Part 2 describes the responsibilities of THC. The TAC requires that state agencies, cities, municipal utility districts, and school districts notify the THC whenever ground-disturbing activities are planned. The TAC (Title 13, Part 2, Chapter 28) also defines how historic shipwrecks are to be protected.

THC has an inter-agency permitting process. Prior to going to THC, permits must be approved by the General Land Office (GLO), where it must be signed and notarized for the issuance of an Authorization to Conduct Underwater Archaeology. This form then is returned to the Qualified Marine Archaeologist (QMA), who must have it notarized before sending it to THC. Once THC has the notarized form in its possession, it will issue a permit number. The permit number must be received prior to commencement of cultural resource survey activities. The QMA then submits an Antiquities Permit Application-Underwater Archaeology and a detailed survey plan including a description of the proposed project and APE, project schedule, research objectives, curation location, description of the equipment suite, overview of shipwrecks, surveys, archaeological sites in the study area, and the Principal Investigator's

(PI) Curriculum Vitae. THC then provides comments on the permit application and survey plan to the QMA.

Texas state water bottoms are divided into tracts with assigned resource management codes describing which natural and cultural resources may be located in these areas. With reference to cultural resources, these areas are described as "avoid impacts to cultural resources," "cultural resources may be present," or "no special concerns." THC will consider these designations and whether shipwrecks and other cultural resources are located within the proposed APE to determine the line-spacing and where cultural resources survey must occur. Within the Three Nautical Mile Limit in the Gulf of Mexico, the maximum survey line-spacing is 20 m (65 ft). Recommended avoidance buffers for cultural resources must be no less than 50 m (164 ft). In Texas waters beyond the Three Nautical Mile Limit in the Gulf of Mexico, the maximum survey line-spacing is 30 m (100 ft); recommended avoidance buffers for cultural resources must be no less than 150 m (164 ft) (TAC Title 13, Part 2, Chapter 28, Rule §28.6).

THC stipulates that a marine magnetometer, side scan sonar, and a recording fathometer must be used during cultural resource investigations. The marine magnetometer must record readings at no less than one reading per second, and the magnetometer must not be towed higher than 6 m (20 ft) above the seafloor. The side scan sonar must have at least a 300 kHz transceiver and should be operated at that frequency or higher. The recording fathometer must be able to record bathymetric data. This equipment suite must be interfaced with a DGPS (TAC Title 13, Part 2, Chapter 28, Rule §28.6).

The PI must be on-site (i.e., on the survey vessel) for at least 25 percent of the cultural resource survey, and a QMA must be present for the remaining 75 percent of the cultural resource survey.

Beyond Phase I survey activities, any subsequent actions that are proposed on shipwrecks must be authorized under a separate permit issued by THC specifically for the proposed activity (Title 13, Part 2, Chapter 28, Rule §28.8).

THC provides additional survey requirements by categorizing the state water bottoms into high-, medium-, and low-probability zones.

Great Lakes Region

Wisconsin and Michigan have both large coastlines and state-run underwater archaeology programs. Both states also have maritime archaeologists on staff who manage submerged cultural resources within their state waters. The state underwater archaeologist for Wisconsin is part of the Wisconsin SHPO and Historical Society, while the state underwater archaeologist for Michigan is under the Department of Natural Resources (DNR) and operates out of the Thunder Bay National Marine Sanctuary.

Wisconsin

Wisconsin's underwater cultural resources relate to its long coasts on two of the Great Lakes, in addition to large bays and rivers. The Wisconsin Historical Society created its Maritime Preservation and Archaeology Program in 1988, as a result of the Abandoned Shipwreck Act of 1987. Bordering both Lake Superior and Lake Michigan, Wisconsin has more than 800 mi of shoreline and an important maritime economy. All archaeological sites located within state water bottoms are protected under Wisconsin Statutes, namely Chapter 44 and Section 44.47, which state that unlicensed field archaeology is prohibited. Therefore, "it is illegal to remove objects or artifacts or conduct of archaeological research on state and municipal lands (County, Civil Town, City, or Village) without a permit from the State Archaeologist" (Wisconsin Historical Society 2018).

The Maritime Preservation and Archaeology Program refers to the *Guide for Public Archeology in Wisconsin: The Wisconsin Archeological Survey* (Kolb and Stevenson 1997; Dudzik, Tiffany, and Stevenson 2012) for permitting and standards, which replaced the *Guidelines for Conservation Archeology in Wisconsin* first published by the Wisconsin Archeological Survey in 1980 (Kolb and Stevenson 1997:v). The *Guide for Public Archeology in Wisconsin* (the *Guide*) ensures that archaeological investigations conducted within Wisconsin waters are in accordance with the

"current state of the discipline following *the Secretary of the Interior's Standard for Guidelines in Archeology and Historic Preservation*" (Dudzik, Tiffany, and Stevenson 2012:6). Wisconsin follows the Secretary of the Interior's Professional Qualification Standards for their definition of a "qualified archeologist" in defining the level of expertise necessary to acquire an archaeological permit in the state (Dudzik, Tiffany, and Stevenson 2012:6). The *Guide* also suggests that professionals looking to conduct a Phase I submerged archeological survey in Wisconsin waters should consult *Archeology and Historic Preservation: Secretary of the Interior Standards and Guidelines*, as well as the *Abandoned Shipwreck Act: Final Guidelines* developed by the National Park Service (NPS), for additional information on the methods and standards for the survey plan.

The *Guide* notes that instrumentation should be tailored to the environment of the APE, categorized variously as land-locked, shallow, or deep water. The *Guide* defines deep-water sites as those located in water at least 6 m (20 ft) in depth. Shipboard survey equipment required for deep-water sites should include a minimum of a navigation and positioning control system, marine magnetometer, side scan sonar, and depth recorder or fathometer. A sub-bottom profiler may also be required based on the project's scope of work. The marine magnetometer should be run with a sampling rate not to exceed 1-second intervals with the device optimally distanced 6 m (20 ft) or less above the seabed. Additionally, the magnetometer should be towed at a minimum distance of 2.5 vessel lengths, and the background noise levels should not exceed 3 gammas peak to peak (Dudzik, Tiffany, and Stevenson 2012:84). The side scan sonar should be run with at least an 800-kHz dual-channel, high-resolution sensor. For shallow water surveys <6 m (20 ft) in depth, the *Guide* recommends the same equipment array but does not specify magnetometer or side scan sonar recording parameters. Surveys should cover 100 percent of the APE, with a maximum of 50 m (164 ft) line-spacing. Following consultation, tighter line spacing may be required in spatially restricted areas or in areas with known archaeological resources. The *Guide for Public Archeology* also notes that all magnetometer data should be contoured in a 10 gamma contour interval (Dudzik, Tiffany, and Stevenson 2012:85).

An important caveat noted in the *Guide* states that "These guidelines also are not all-inclusive with respect to methodology; for particular survey environments, other options might be employed for identifying submerged cultural resources" (Dudzik, Tiffany, and Stevenson 2012:83). This provides a level of authoritative flexibility on the part of Wisconsin's Maritime Program, encouraging a better collaborative process between the state and the permit seeker. The Maritime Preservation and Archaeology Program maintains the state's database of known shipwrecks and submerged archaeological sites. The database is not in the public domain, but researchers are encouraged to visit the office and use the resource.

Michigan

Michigan has one of the longest coastlines of any state, with 3,288 mi (5,291.52 km) of shoreline and 39,876 sq mi (103,278.4 km^2) of submerged bottomlands within state borders. As a result of the vast amount inland rivers, surrounding waterways, and passages to both the Atlantic Ocean and Midwestern states, Michigan has a rich maritime history. According to the NPS, an estimated 2,000 ships have been lost within Michigan state waters of the Great Lakes, 1,400 of which have known locations and have been recorded (NPS 2018a). Michigan's underwater cultural resources are managed by the State Underwater Archaeologist, who works within the Department of Natural Resources (DNR). The Michigan DNR State Underwater Archaeologist works closely with the staff of the Thunder Bay National Marine Sanctuary to help protect and preserve the state's submerged cultural resources. NOAA designated Thunder Bay National Marine Sanctuary in 2000; it was designed to be managed jointly by NOAA and the State of Michigan.

Under Michigan law, the state supervises all archaeology performed on state lands, including state water bottoms. In 1994 the establishment of the Natural Resources and Environmental Protection Act (Public Act 451, Part 761) required that a permit be obtained prior to commencing any archaeological project within state borders

(Michigan State Housing Development Authority 2018). Nondestructive archaeological recording or survey projects, however, do not require a permit within Michigan waters, nor is a permit required to search for, dive on, explore, or photograph a shipwreck site, provided that no artifacts are disturbed and nothing is recovered (Michigan Department of Environmental Quality 2018).

While the state underwater archaeologist, employed by DNR, oversees all maritime archaeological projects, three government agencies collaborate to protect Michigan's submerged cultural sites. These agencies include the Office of the State Archaeologist in the Michigan Historical Center, the Department of Environmental Quality, and the DNR.

Pacific Region

In general, states along the Pacific Coast have not promulgated refined guidelines or developed programs devoted to submerged archaeological resources within their state water bottoms. On the federal level, BOEM Pacific Region is responsible for managing the development of conventional oil and natural gas, renewable energy resources, and mineral resources on the OCS offshore California, Oregon, Washington, and Hawaii. In 2015 BOEM Environmental Studies Program initiated a study using existing seafloor data to identify and develop a model of potential submerged landforms that could indicate the presence of prehistoric archaeological sites on the Pacific OCS (BOEM 2015).

Washington

The Department of Archaeology and Historic Preservation (DAHP) is Washington State's primary agency for managing, preserving, and promoting all of the state's historic and cultural resources. DAHP has published survey, inventory and reporting guidelines for Section 106 undertakings (WA DAHP 2018). However, the guidelines do not specifically address submerged cultural resources surveys, although they do provide a link to download a Submerged Historic Archaeological Resource Registration Form.

DAHP requires an Archaeological Excavation and Removal Permit (Washington Administrative Code [WAC] Chapter 25-48), for any "alteration, digging, excavating, or removal of archaeological objects or sites or historic archaeological resources which have been abandoned thirty years or more, and to the removal of glyptic or painted records or archaeological resources from native Indian cairns or graves" (WAC §25-48-020). In addition, DAHP requires an application for the excavation and/or removal of a previously registered historic archaeological resource that is a shipwreck or historic aircraft (WAC§25-48-085). Washington is one of the more lenient states for conducting archaeological projects; it still issues salvage permits.

Oregon

The Director of the Oregon Parks and Recreation Department (OPRD) is Oregon's designated SHPO. The Assistant Director for Heritage Programs serves as Deputy State Historic Preservation Officer. Under state law, OPRD is responsible for issuing permits for the excavation or disturbance of archaeological sites. Archeological permits are required for excavations on public lands and within existing archaeological sites on private lands. The SHPO has developed a statewide comprehensive *Historic Preservation Plan* (ORPD 2016) that provides a framework to guide SHPO activities and to coordinate preserving the state's historic and prehistoric resources.

The *Oregon Archaeology Guidelines* (ORPD 2016: Appendix G [Guidelines For Underwater Archaeology]) provide general guidance to underwater archaeological research and briefly outline Phase I, II, and III techniques to assist archaeologists and agency administrators in developing a research design for identification and evaluation of submerged cultural resources, primarily sunken vessels. A stated objective of the research design is that project results contribute to better understanding of Oregon's past. The *Oregon Archaeology Guidelines* (2016: Appendix G) note that survey instrumentation should include multibeam echo sounding, side scan sonar, marine magnetometer, sub-bottom profiler, as well as in-water diving or remote-operated vehicle (ROV) surveys, as appropriate.

The *Oregon Archaeology Guidelines* (2016: Appendix G) direct diving archaeologists to safety standards such as those developed by the

American Academy of Underwater Scientists (AAUS). The AAUS standards do not comport to the U.S. Department of Labor, Occupational Safety and Health Administration's (OSHA's) commercial diving operations (OSHA 2017), the USACE (2014) health and safety requirements, or industry best practices for commercial diving (ADCI 2016).

California

California's submerged cultural resources are managed by the SHPO and the California Department of Parks and Recreation. The CA SHPO requires that a permit application be submitted and approved to study, excavate, or search for a shipwreck in state waters. The CA SHPO can issue two types of permits relating to the study of shipwrecks: Recreational, Recovery, and Salvage. The Recreational Recovery Permit allows for exploration and occasional limited excavation. The salvage permit allows:

> "Searches for vessels with electronic equipment and are issued to individuals or organizations representing museums, universities, colleges, or other recognized scientific or educational institutions and individuals or organizations with the capability to conduct the activities" (NPS 2018b).

Standards for marine archaeological surveys are decided on a case-by-case basis. California Public Resources Code §§6301, *et seq*., and California Code of Regulations Title 2 §§ 2002, *et seq.*, and 14 §§ 929, *et seq.*, declare that California's archaeological resources may be threatened by development, increased population, and natural forces and therefore need protection and preservation in order to improve public knowledge of the state's historic and prehistoric past (NPS 2018b).

Discussion

As noted previously, marine archaeological program characteristics are tabulated on a state-by-state and agency-by-agency basis in Table II-1. The preceding summaries of the varied federal and state administrative and management practices demonstrate some of the different approaches developed to protect submerged cultural resources and to comply with NEPA, NHPA, and the Abandoned Shipwreck Act of 1987. BOEM and USACE have markedly different regulator programs: The BOEM supervises oil/gas and renewable energy projects for compliance with NHPA and NEPA for offshore federal water bottoms, and administers their programs at a regional level. Published NTLs provide project proponents with specific guidance and recommendations to ensure that cultural resources information is acquired in a manner sufficient to satisfy agency requirements. BOEM's standards for renewable energy activities currently provide the most comprehensive guidance for resource protection; they have paved a path of best practices, and continue to influence other federal and state compliance programs.

USACE is responsible for managing most, if not all, activities impacting the maintenance of our harbors and waterways. Its individual districts administer NHPA and NEPA with different management approaches, but as a basic commonality, each district requires consultation to develop scoping requirements based on industry best practices. Given the diversity of the marine environments and activities administered by the USACE, a best-practices approach may provide the most practical and responsible guidance from a compliance viewpoint.

The tabulated overview in Table II-1 demonstrates how various states and federal agencies guide compliance with NHPA and NEPA, and elucidates the strengths and weaknesses of state-level programs for administering state water bottoms, and federal-level programs for administering the OCS and navigable U.S. waterways. Most notably, only 50 percent of the states that administer preservation programs specific to submerged cultural resources have a permanent maritime staff. Within the New England region, only Massachusetts possesses such a staff; in the Mid-Atlantic region, Maryland is the only such state. A total of seven other states discussed in this report employ maritime archaeology and/or maritime history staff. The management programs developed by Massachusetts and Maryland have departed from BOEM model (as promulgated in the NTL) and have developed more regionally specific guidelines for compliance and stewardship.

The strengths of Massachusetts' program lie in its statutory permit requirements and, like BOEM, in its administrative ability to provide departures from the regulations and guidelines when environmental issues unavoidably constrain the scope of work and threaten project success. One of the strengths of the Maryland program, in addition to its maritime staff, is in MMAP's active solicitation of volunteers, and its cooperation with volunteer groups, to manage and provide education about the state's submerged cultural resources.

As Table II-1 demonstrates, three-quarters of the state programs reviewed here require a permit for activities affecting submerged cultural resources, as do the three USACE districts discussed. All states and agencies require coordination with the SHPO, even if no formal permitting process exists. Despite the small number of states employing maritime staff, less than half the states and none of the federal agencies require the presence of a QMA during underwater investigations; most, however, require the PI to meet the SOI's professional qualification standards in archaeology (80 percent). BOEM, but not USACE districts, also requires the PI to meet the SOI's standards. The practice of publishing guidelines for Phase I, II, and III work by states and federal agencies also varies. While many states (nine) and one federal agency (BOEM) publish guidelines for Phase I surveys, only three states (Florida, Oregon, and Wisconsin) have published guidelines for Phase II investigations, and two (Oregon and Wisconsin) have published guidelines for Phase III work. Minimally, most states and federal agencies also speak to either specific equipment arrays or else let applicants know that such requirements are to be determined during the coordination process. Most states and federal agencies specify minimum line-spacing requirements (or allow it to be determined on a case-by-case basis); survey track-line spacing ranges from 15 to 30 m (50 to 100 ft). Finally, the use of sub-bottom profilers is mandated by all states and federal agencies other than Michigan.

Observations on Phase I Investigations

Phase I investigations, or site identifications, are conducted to identify cultural resources. Prior to conducting fieldwork, the archaeologist conducts background research to determine what types of resources may be encountered, the nature and extent of any identified archaeological sites or shipwrecks, and what studies and surveys have been conducted and how those results may inform the current investigation. This research should guide development of the survey plan, which details the instrumentation and methodology to collect archaeological information. Remote sensing surveys should employ an equipment array that consists of marine magnetometer, side scan sonar, and sub-bottom profiler. A single or multibeam echo sounder is recommended to identify potentially significant cultural resources. Geotechnical sampling (i.e., sediment boring or grab samples) may be employed to ground-truth the geophysical results and to ascertain the likelihood of locating preserved submerged prehistoric sites. The results of the investigations should incorporate environmental and cultural contexts, and develop recommendations for additional investigation or avoidance protocols. All such recommendations should be vetted in in consultation with the state and lead federal agencies. State-by-state comparison of Phase I guidelines revealed that while some states have a well-defined application process, other states issue permits on a case-by-case basis. All states have qualifications requirements that apply to the PI, who must meet Secretary of the Interior Standards or state-specific qualified marine archaeologist (QMA) requirements. Many states do not publish specific methodologies pertaining to Phase I surveys, but all state programs reviewed here do require some level of coordination with the SHPO.

Notes on Phase II Investigations

Phase II site evaluations are conducted to evaluate whether a site or shipwreck is eligible for listing on the NRHP. The evaluation should assess the site's horizontal and vertical integrity and provide recommendations for preservation, i.e., avoidance, or future study, i.e., mitigation. The objectives of evaluation usually are achieved through diving and/or ROV investigations, although high-resolution multibeam survey may be sufficient to document a shipwreck and its integrity in some conditions. It is important to note that environmental constraints (i.e., depth, bot-

tom current, contaminated sediments, etc.) and the research objectives will inform the investigation methodologies. The strategy for these investigations should focus on the portion of the site that will be subject to direct impacts. The ORPD states that "Phase II investigations should not be initiated without consultation with SHPO." However, the *Oregon Archaeology Guidelines* (ORPD 2018: Appendix G) provide a limited discussion of Phase II testing and evaluating submerged cultural resources.

Florida, Oregon, and Wisconsin are the only state programs reviewed for this study that provide published guidance for Phase II investigations; Massachusetts and New York, like Florida, have permit requirements and/or recommend specific actions. In Florida, the Bureau of Historic Preservation's Review and Compliance Section and the BAR require a permit and both validation and ground-truthing of potentially significant underwater anomalies. The MA BUAR requires a permit that describes the permit area, APE, project description, research design, schedule, budget, personnel chart, recording methodology, and conservation plans. New York's SHPO guidelines state that "methods should be designed in cooperation with the reviewing agency in compliance with specific guidelines for the systematic and scientific conduct of these types of investigations" (New York Archaeological Council 1994:7).

Notes on Phase III Investigations

A Phase III, or data recovery, investigation is conducted to mitigate adverse effects to a site determined eligible for listing on the NRHP. The goal of a Phase III investigation is to acquire as much cultural, environmental, and interpretive information as possible prior to disturbance. Phase III investigation of a shipwreck site involves excavation, artifact retrieval, site documentation, and conservation. Alternative mitigation measures may be appropriate in situations where impacts are confined to a portion of site, or environmental or other constraints make excavation extremely difficult or unsafe. In either scenario, it is important to ensure that the parties involved understand that artifacts recovered from marine environments require special conservation methods and facilities (Hamilton 1998).

Most of state programs examined for this report do not provide published guidelines for Phase III mitigative submerged cultural resource data recovery, although the guidelines of Oregon and Wisconsin do address data recovery operations. At a minimum, however, a research design should be developed in consultation with the SHPO, the lead federal agency, and other consulting agencies to ensure appropriate mitigation of effects and to maximize data collection. Several states discussed herein require Phase III investigation permits: Florida, Massachusetts, and New York. In those cases, the permitting requirements mirror those necessary for Phase II permits.

Chapter III

Understanding the Range of Potential Effects to Submerged Cultural Resources

As the preceding discussion and Table II-I have illustrated, the approaches taken by coastal states, and the programs those states have implemented to protect and regulate submerged cultural resources, are variable. Most states have centralized programs for oversight of underwater historic properties, most frequently under the umbrella of their respective State Historic Preservation Offices (SHPOs). However, in some other states like Michigan, statutory authority sometimes is shared across several state agencies with slightly different regulatory foci in the submerged environment. Similarly, the relative sophistication of state programs, and hence of the extent to which guidelines have been fully developed and operationalized, is variable. Nevertheless, there is recognition in the legal codes of the coastal states, not only at the federal level, that submerged cultural resources are meritorious of state protection and regulation where federal statutes do not apply, and that such protection requires formal permitting and oversight.

Furthermore, and in light of technological improvements in positioning, i.e., the evolution from Loran C to highly accurate and satellite-based GPS, and in the various components of the remote sensing array used for offshore exploration, construction engineering, and hazards surveys, the nature of offshore exploration and identification of drowned resources has improved vastly over the past few decades. Appreciation of the sensitivity of some now-submerged but formerly aerially exposed landforms as potential venues of prehistoric activity and settlement, and the importance of some of those landscapes to Native Americans, also occurred at a time when the technologies for characterizing sub-bottom environments were improving dramatically. As a result, there also is broad agreement across federal and state agencies about the nature of the geophysical instrumentation stipulated for marine remote sensing surveys.

Despite the general ubiquity of state permit requirements for underwater archaeological work, and of at least some level of methodological guidance, the intrinsic complexity of cultural resources work in the marine environment also is recognized in two aspects of programs across state and federal agencies. First, there is broad consensus across the programs discussed above that agency consultation is a necessary precursor both to accurate scoping of projects and to protection of the resource base. The role of the SHPO in such consultation is critical to the Section 106 process for federal undertakings. It assumes central importance for any projects in state waters, even when there is no federal nexus. Second, and while several states evaluate project plans for marine archaeological compliance work and permits solely on a "case-by-case" basis, virtually all of the states articulate the need for planning and consultation on a case-by-case basis. The rationale for reviewing each project or application *de novo* no doubt stems in large part from three primary factors: (1) the potential for serious damage or destruction of drowned sites from offshore construction; (2) methodological complexity not only in identifying and evaluating submerged resources, but also in recognizing damage to resources below the sea; and (3) the diverse nature and extent of offshore construction projects.

The following observations, and Table III-1 below, characterize the nature of common offshore construction activities and their associated potential for impacts to submerged sites. Each class of construction activity poses its own challenges to the survival of historic properties. Furthermore, not all potential effects are obvious or even primary to the construction. For example, anchor and cable sweeps (and drops) several thousand meters away from a construction trench have at least as much potential to destroy a shipwreck as trenching on one. In short, each specific project merits review from the standpoint of the totality of potential effects. Doing so presupposes careful consideration and definition of the APE even before the methodology for identification is approved.

Classes and Effects of Offshore Construction Activities

Table II-1, below, reviews the primary classes of marine construction activities and the methods used to accomplish them. It also describes the various construction procedures and the equipment used for each. These data are provided in checklist form to assist in reviewing project ("undertaking") application packages for completeness; to inform about the nature, materiel, and potential effects of offshore construction; and to help assure proper review and confirmation that project planning fully anticipates the range and distribution of potential effects. It also characterizes the nature of potential impacts to resources for classes of construction in both their horizontal and vertical aspects. As readily seen, potential effects vary widely in kind and in their geographic distributions. Clearly, each project first needs to be fully explicated in terms of the totality of its APE. The APE is the "geographic area or areas within which an undertaking may directly or indirectly cause changes in the character of or use of historic properties, if any such properties exist" (36 CFR § 800.16(d)). The APE for submerged archaeological resources includes all areas where the seabed may be disturbed (horizontal and vertical extents). Once the APE is established, the survey plan should capture all areas associated with potential direct impacts. Doing so should anticipate the project's life cycle, and consider operation, maintenance and decommissioning activities as well as the primary construction. In this regard, it is important to note that many classes of construction entail multiple operations over lengthy periods of time. It also is important to note that engineering and design processes for virtually all large-scale offshore construction projects must be supported by geophysical survey and geotechnical investigations; the latter typically include field sampling in the form of coring, boring, or test dredging, followed by laboratory testing, and analyses performed in support of project design. Such operations should be reviewed for the presence of potentially significant subsurface cultural resources before being allowed to proceed.

Clearly, guidelines for cultural resources survey in the marine environment can help bring rigor and consistency to identification efforts. However, cautious flexibility and case-by-case review of both the APE and the survey plan are warranted before survey and identification is approved and a permit issued for work on state water bottoms. This applies to all phases of work, as well as to common types of equipment, because project proponents otherwise simply may implement standard guidelines uncritically without proper coordination, i.e., "ask for forgiveness rather than for permission." Determining project requirements with project plans in hand will allow the CT SHPO to ascertain and require the appropriate levels of work on a case-by-case basis, and to keep the resource base in the forefront, as is both appropriate and necessary under state and federal historic preservation laws.

Table III-1. Classes of Offshore Activities and Related Impacts to Cultural Resources

Class of Activity	Construction Method	Technology / Procedure	Basic Equipment	Methodology and Associated Impacts
Coastal Restoration	Dredging and Excavation	Mechanical Dredging	Grab or clamshell, enclosed bucket, and articulated bucket. The bucket sizes vary and, depending on working methodologies (i.e., grab, clamshell or bucket ladder) the associated level of impacts will vary with the type of equipment utilized.	Sediment is lifted to the surface using a mechanical excavator or crane and placed on a barge. Mechanical methods can be used to remove debris and hardened sediments. Dredge patterns will vary and therefore the working methodology must define area and depth of impacts (i.e., horizontal and vertical APE). The impacts should address the associated anchor handling plan (including headline and sideline anchors and anchor sweep).
		Hydraulic Dredging	Hydraulic dredges include cutter head, swinging ladder cutter head, horizontal auger, plain suction, pneumatic, specialty, and diver-operated.	Hydraulic dredging methods add water to the sediment and remove it by pumping it in the form of slurry, typically through a pipeline to a dewatering location, final disposal or containment site. Hydraulic dredging methods are suitable for dredging soft sediments; but not for removing debris or hardened sediments. Discharge of the dredged materials is done by either pipeline or by barges. Staging areas, pump out, booster pump stations, and conveyance corridors should be addressed for potential impacts.
		Dredged Material Unloading	Barge-unloading dredger, tugs, lattice boom crawler crane, and clamshell bucket	The barge-unloading dredger is a stationary special-suction dredger anchored by spuds near the shore, where the water depth is sufficient for the loading barges to come alongside the dredger. Barge-unloading dredgers are used for emptying loaded barges either by suction dredgers or by bucket-ladder dredgers and cranes. The dredged materials are then transported to a placement site. To secure the loaded barge it may be necessary to construct unloading wharves, dolphins, etc., all of which must be addressed as potential impacts.
Subsea Utilities (Oil/gas/power)	Pre-Construction	Route Clearance and Pre-Lay Grapnel Runs	Towing vessel with grapnel anchors and lay barge with subsea plow equipment	A towing vessel will pull grapnel anchors along the planned trench to clear the first few feet of sediment below the mudline. This work usually takes place about one year prior to the start of cable- or pipe-laying operations. The debris is recovered on-board the vessel and then disposed of at an approved onshore site. In addition to grapnel runs, prior to the cable- or pipeline-laying operations, a trial jet-plow run will be performed following the grapnel run to clear the route to full depth of burial.
	Trenching and Embedment	Horizontal Directional Drilling (HDD)	HDD drilling rig	HDD is an installation method for pipe or conduit that is commonly used during pipeline, cable, and outfall installation. The HDD process depends on the geotechnical characteristics of the borehole route and size, length, and diameter of cable or pipe that must be pulled to offshore. The upland (i.e., landfall or onshore) entry pit is drilled from an onshore entry point towards the offshore exit point. The pipeline, cable, or other conduit is pulled through the reamed hole from onshore towards offshore by a HDD rig located onboard a drill barge. This is a standard alternative to the conventional open trench method. The seabed geology determines depth, size of conduit, installation technique, cofferdams, etc. The upland (onshore) work requires access and staging to support excavation equipment. Geotechnical boring samples performed to the depth of burial may be collected to characterize subsurface soil conditions in the onshore and offshore. Impacts associated with the HDD construction activity must consider geotechnical testing, the staging areas, pit sizes, and the depth along the slope of the conduit.
		Plowing	Sled-type, jet-assisted plowshare	The overall body of the subsea plow varies with the application; however, they are typically about 5 m (16.4 ft) wide, and ride on two hydraulically actuated and independently adjustable skids on either side of the plow body .This is to control plow stabilization and burial depth. Plow operations typically will create a temporary 0.75-m-wide (2.5 ft) furrow in the seabed in which the new cable will be simultaneously laid and buried. Impacts will not only vary with the plow design, but also with the seabed geology (e.g., sand vs. glacial till). Impacts associated with plowing operations should cover the entire construction corridor.
		Dynamic Positioning (DP)	Class of Operations: Class 1 (DP 1), Class 2 (DP 2): Class 3 (DP 3)	The vessel's station-keeping, heading, and guidance are maintained and controlled by the DP system. Although impacts may be negligible, it would be important to understand the types of associated activities (i.e., crane operations), and safeguards in the event of a system failure, particularly during shallow water operations where the effects of strong tidal streams and currents can affect the vessel's station-keeping capabilities.
	Pipe laying	Tow-in S-lay J-lay Reel barges	Pipe-lay barges, reel barges, anchor-handling tugs	Lay barges can be maneuvered by using a system of anchors that are handled independently by anchor-handling tugs. The barge controls its position, speed, and heading using anchor winches. For tow-in, the pipe is suspended in the water via buoyancy modules, and tug boats tow the pipe into place. Once on location, the buoyancy modules are removed or flooded with water, and the pipe sinks to the seafloor. There are four main forms of tow-in pipeline installation: surface tow, mid-depth tow, off-bottom tow, and bottom tow. During S-lay pipeline installation, the pipe is eased off the stern of the vessel as the boat moves forward. The pipe curves downward from the stern through the water until it reaches the "touchdown point" on the seafloor. As more pipe is welded in the line and eased off the boat, the pipe forms the shape of an "S" in the water. J-lay pipeline installation puts less stress on the pipeline than an S-lay installation, by inserting the pipeline in an almost vertical position. Reel barges contain a vertical or horizontal reel that the pipe is wrapped around. Reel barges are able to install both smaller diameter pipe and flexible pipe. Horizontal reel barges perform S-lay installation; while vertical reel barges can perform both S-lay and J-lay pipeline installations. Barging requires anchor spreads and anchor-handling tugs. Reel barge installation requires a land-based work site and storage area. Pipe sections for tow-in methods are welded in-line on the lay barge. However, only specially designed pipe-in-pipe pipelines can be reeled. Impacts as a result of anchoring and mooring activities will be shallow; however, additional impacts can result from anchor/mooring chain and cable sweeps.
Shoreline Restoration and Beach Replenishment	Floating Pipelines	Tow-in	Floating discharge pipelines can be composed of rubber, steel, high-density polyethylene (HDPE) or ultra-high molecular weight polyethylene pipes (UHMWE). The floating pipes may be supported by floating pontoons, buoys, or other flotation devices.	Floating pipelines are supported in the water column or on the water surface over the seabed. Floating pipeline conveyance corridors are typical in coastal areas where there is limited vessel and boat traffic. Potential impacts depend on whether the pipeline is buoyant or semi-buoyant and how it is secured in place (i.e., anchoring).
		Barging	There are various types of jack-up barges, including deck cargo barges, semi-submersibles, crane barges, and spud-pontoons, which can be self-propelled and incorporate DP capabilities.	The jack-up barge is a self-leveling work platform typically used in offshore renewable, oil and gas, and civil works projects. The jack-up barge is typically mobilized to and from the work site using a tug vessel. However, a new class jack-up can be mobilized using DP. Jack-up barges have limited maneuverability once anchored. Anchor-handling tugs are required for non-DP vessels, which are suited for work in deep water. Impacts associated with jack-up barges must consider the vessel's total footprint (horizontal and vertical) on the seabed.

Class of Activity	Construction Method	Technology / Procedure	Basic Equipment	Methodology and Associated Impacts
Maritime Infrastructure (Bridge, pier and bulkhead construction, seawall rehabilitation, and streambank stabilization)	Cofferdam	Sheet Piling	A vibratory hammer operated off of leaders mounted on track-based machines or suspended from crawler cranes drive the beams or king piles as far as possible. Diesel impact hammers and hydraulic press-in machines can also be used to drive or push the piles into place. Sometimes water jetting or pre-boring is used to assist penetration through hard layers.	Sheet piling is a construction product with a mechanical connection "interlock" at both ends of the section. These mechanical connections interlock with one another to form a continuous wall of sheeting. Sheet pile applications are typically designed to create a rigid barrier for earth and water, while resisting the lateral pressures of those bending forces. The shape or geometry of a section lends to the structural strength. In addition, the soil in which the section is driven has numerous mechanical properties that can affect the performance. The typical cofferdam, such as a bridge pier, consists of sheet piles set around a bracing frame and driven into the soil sufficiently deep to develop vertical and lateral support and to cut off the flow of soil and, in some cases the flow of water. For a typical cofferdam, such as for a bridge pier, the construction procedures include: dredging to level the area of the cofferdam; installing temporary support piles; erecting a temporary brace or frame on the support piles; setting the sheet piles; driving the sheet piles to grade; excavating inside the grade or slightly below grade, while leaving the cofferdam full of water; drive bearing piles; and placing rock fill as a leveling and support course. Impacts to the seabed extend to the full depth of the sheet piles and any bracing structure.
	Piles	Pile Driver	There are six broad types of pile drivers: diesel hammer, vertical travel lead systems, hydraulic hammers, hydraulic press-in, vibratory pile driver/extractor and piling rig. Pile-driving components may include cranes and specialized tools such as water jets, drills, punches and followers.	The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Pile types include concrete piles, pipe piles, steel h-piles, timber piles, composite piles, steel sheet piles, and hollow-core cylinder piles. Driven piles are typically constructed of concrete, steel, or timber. Driven-sheet piles are used for shoring and cofferdam construction. Hydraulic hammers are typically used to drive steel tube pipes, sheet piles, precast concrete piles and timber piles. Whereas, vibratory hammers may be used for the piling and extracting of steel sections such as sheet pile walls, H-beams and pipes as well as alternative foundation methods like gravel and sand piles. They are also used for the driving of large diameter casings in offshore applications such as wind turbine and platform foundations. Impacts must consider driving method and maximum depth of piling.
Offshore environmental assessments (wind, waves, temperature, etc.) Oil and gas environmental monitoring Maritime domain awareness (i.e., security) Offshore Renewable Energy	Meteorological (MET) Buoy Installation	MET Buoys	Basic equipment includes various vessels (personnel transfer vessels, tugs, etc.), cranes, forklift, etc.	Deployment of a MET buoy typically involves delivery of the system to its operating location and deployment of the mooring. Moorings can include surface and sub-surface types. There are typically additional impacts associated with shallow geotechnical investigations (i.e., grab sampling and vibratory coring) conducted at the operating location.
	MET Tower Installation	MET Towers	The foundation type can be a steel monopole, concrete gravity base, steel or concrete tripod, a steel jacket, floating base, or a mobile jack-up platform.	The equipment and materials may be delivered to an onshore facility or via offshore work vessels, which may include jack-up, crawler crane and derrick, or barge and crane. Typically, a laydown area is required for towers, nacelles, foundations, and the turbine blades. Expect additional impacts associated with deep geotechnical investigations (i.e., deep coring, >50 m/164 ft).
	Turbine Installation	Foundation Installation Turbines	Turbine foundation types include monopole, jacket/tripod, and floating structures (semi-submersible and spar).	Basic equipment includes various vessels (personnel transfer vessels, hotel ships, tugs, etc.), floating and heavy lift cranes, etc. Staging and anchoring areas must be considered for potential impacts.
	Cable laying	Inter-array Cables and Export Cables	Cable-laying platform, cable-laying vessels, tugs, barges, trenching or cable-plow equipment, ROVs, and rock-dumping vessels.	Cable-plowing or -trenching is used to bury the cable and then, in some situations, rock-dumping is applied for added cable protection where buried depth is shallow. Impacts include anchoring, trenching or plowing, and cover extents to full depth of burial.
		Offshore Transformer Station	Offshore Transformer Stations typically have a seabed foundation and surface platform	The offshore transformer is constructed onshore and then transported to the nearest seaport. Offshore tugboats tow the transformer station to the construction site. Impacts must be considered for the seabed foundation.

Chapter IV

A Brief Guide to Application of the National Register of Historic Places Standards and Guidelines to Submerged Sites

This chapter provides guidance designed to assist in the assessment of the significance and integrity of submerged cultural resources such as sites, shipwrecks, and their associated objects in accordance with the National Register of Historic Places (NRHP) Criteria for Evaluation (36 CFR 60.4[a-d]). The NPS defines significance as the why, where, and when a property is important, whereas integrity is defined as the ability to convey significance (United States Department of the Interior-National Park Service [USDOI-NPS] 2002).

Property Type Classification

Classes of properties that may be eligible for listing on the NRHP include buildings, structures, objects, sites, and districts. As property types, shipwrecks may be classified as structures or archaeological sites under the NRHP guidelines (USDOI-NPS 2002). In the NRHP guidelines, the term *structure* is used for constructions made for purposes other than creating human shelter. However, shipwrecks resulting from a sinking event that affected the structural integrity of the vessel are considered a "ruin," and categorized as archaeological *sites*. Archaeological sites are defined as the locations of significant past events where the remnants of a past culture survive in a physical context that allows for the interpretation of the remains regardless of the value of any existing structures (USDOI-NPS 2002).

NRHP Bulletin 20, *Nominating Historic Vessels and Shipwrecks to the National Register of Historic Places* (USDOI-NPS 1992a), lists five basic types of historic vessels that may be eligible for listing: floating historic vessels, dry-berthed historic vessels, small craft, hulks, and shipwrecks. Bulletin 20 (USDOI-NPS 1992a:3) states that "[to] qualify for the National Register, a historic vessel must have significance as one of the vessel types listed above and retain integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the National Register criteria A, B, C, and D." To determine the significance of a historic vessel, one must establish whether the vessel is "1) the sole, best, or a good representative of a specific vessel type; 2) is associated with a significant designer or builder; or 3) was involved in important maritime trade, naval, recreational, government, or commercial activities" (USDOI-NPS 1992a:3).

All evaluations for shipwrecks should begin with a description of the vessel, which should include characterizations of the type, dimensions, materials, method of construction, layout, rig, and date of construction. The "type of vessel" includes discussion of the ship's rig (i.e., bark, barkentine, schooner, ship), hull form (clipper, "downeaster"), and of the materials used to construct the hull (wood, iron, steel). The vessel's typology can also include trade or occupations, such as cargo ship, container ship, hospital ship, or warship. The NRHP guidelines suggest that the description of the vessel type should attempt

to incorporate all or as many of these aspects as possible (USDOI-NPS 1992a).

Vessel Typology

Within Connecticut waters, only a few studies have provided a typology of vessels that historically operated in the area. The most comprehensive applied study was completed by George et al. in the 2007 work entitled *Documenting Shipwrecks in the Connecticut Waters of Long Island Sound*. That study utilized primary and secondary literature, data from internet sites, and information from readily available electronic databases such as NOAA's Wrecks and Obstruction Databases (United States Department of Commerce, NOAA 2017a), which source data from the Electronic Navigation Charts (ENC) and the Automated Wreck and Obstruction Information System (AWOIS). These data were compiled into a GIS database to assist in that study. George et al. (2007) identified 403 named and unknown vessels, 120 of which were classified with vessel typologies applying 10 primary vessel types: barge, cabin cruiser, ferry boat, fishing vessel, schooner, ship, sloop, steamboat, submarine, and tug boat (George et al. 2007:64). The two most frequent vessel types were barges (28) and schooners (50). According to George et al (2007:66), the numbers of barges and schooners reflected the long-operating histories of both vessel types in the region owing to their versatility, as well as to the fact that both of these vessel type names were used as generic descriptors of ship types throughout history.

In this vein, knowledge of the historic vessel types that plied or frequented Connecticut waters is central to identification of shipwreck sites, and to evaluation of historic shipwrecks for NRHP eligibility. Building on the work of George et al. (2007), a comprehensive geodatabase of submerged historic resources in Connecticut waters of Long Island Sound prepared for the CT SHPO (R. Christopher Goodwin & Associates, Inc. 2018) expands the typology and identified numerous additional vessel types. That database incorporated vessel types enumerated in the Connecticut Ship Database, 1789-1939, compiled by the WPA from the records of the United States Customs Service; vessel type assignations reflected in archeological site forms maintained by the CT SHPO and the Office of the State Archaeologist; and data from sample surveys conducted by RCG&A (2018) in Connecticut coastal waters. The expanded list of vessel types incorporated into the CT SHPO geodatabase toolkit now includes a comprehensive classification that incorporates vessel types as diverse as dugout canoes, rowboats, barks, pinnaces, shallops, periaugers, ketches, galleys, dredge boats, a variety of freighters, a variety of steamships, tug boats, canal boats, a range of war fighting vessels including destroyers and submarines, yachts, and other pleasure craft including houseboats. In addition to vessel types for specialized uses, several historic vessel types, like barks, pinnaces, and ketches, had capacities of up to 200 tons and were used as small-scale commercial vessels during the Colonial Period (1630-1774). During the early to mid-nineteenth century, those smaller vessels were gradually phased out and replaced by larger and more specialized watercraft like barges and schooners. The geodatabase is expandable in case previously unidentified vessel types are recognized in the future.

Evaluating NRHP Significance

Properties containing built resources are evaluated within their appropriate historic context by applying the National Register criteria for evaluation (36 CFR 60.4 [a-d]). To be eligible for listing in the NRHP, a property generally should be at least 50 years old. The areas of significance for shipwrecks include American history, architecture, archaeology, engineering, or culture; integrity is evaluated with reference to location, design, setting, materials, workmanship, feeling, and association. For a shipwreck to be considered significant, the vessel must possess significance under one or more of the NRHP criteria (a-d), which are reviewed below (USDOI-NPS 2002).

Criterion A: Association with events that have made a significant contribution to the broad patterns of our history:

Shipwrecks evaluated under Criterion A must be associated with an event, broad patterns of events, or historic theme(s) that have made

significant contributions to the history of the United States, the State of Connecticut, or a local community. Because so many specific types of ships were used over multiple historic periods, multiple areas of significance (listed in Bulletin 15 [USDOI-NPS 2002]) often are applied. The most obvious theme, noted in Bulletin 15 (USDOI-NPS 2002), would be *Maritime History*. However, Bulletin 20 (1992a) provides 16 additional areas of significance that include: Agriculture, Commerce, Communications, Engineering, Exploration/Settlement, Government, Industry, Invention, Law, Literature, Military, Recreation/Entertainment, Science, Social/Humanitarian, Theater, and Transportation. That bulletin further explains how each of those categories applies to shipwrecks with reference to Criterion A. Because of their possible association with specific historical themes, shipwrecks may be evaluated under Criterion A.

Criterion B: Association with the lives of persons significant in our past:

For a shipwreck to be eligible under Criterion B, it must be associated with or tied directly to a person significant in American history. Although Criterion B might include a noted shipbuilder, the work of architects and engineers routinely falls under Criterion C for the work of a master. Rather, for a shipwreck to be considered under Criterion B, a historically significant person more typically would been a noteworthy sea captain or a noted member of the crew whose actions were important in American history. An example of an eligible shipwreck under Criterion B would be the USS *Olympia* because of its association with Admiral George Dewey, famed for his victory in the Battle of Manila Bay (USDOI-NPS NPS 1992a:7). But vessels that sailed in the fleet of a noted admiral or commodore also may be eligible under Criterion A. Applicable areas of significance under Criterion A include Exploration/Settlement, Invention, Law, Literature, Science, and Social/Humanitarian.

Criterion C: Embodiment of the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values:

Criterion C is the most common criterion for shipwreck significance alongside Criterion D. Shipwrecks can be eligible under this criterion within the following categories: architecture, art, and engineering. Shipwrecks may be significant if they embody a defined type, especially if it is a rare surviving example, representation, or the first, early or pure example of a type. Under the architecture category, a shipwreck may be eligible if it is a good representative of a certain type of naval architecture, or a good example of a particular historic shipbuilder whose craft represents the work of a master (USDOI-NPS 1992a:7). The category of art can be applied if the vessel had distinguished aesthetic aspects that set it apart from the utilitarian functions of the vessel. Examples of this would be design features, decorations, figureheads, and distinguished interiors sometimes found on steamers, ferries, and ocean-going passenger steamers. The engineering category may be applicable because of the vessel's design, propulsion systems, specific types of marine engines, and modes of propulsion as strong representations of their vessel type (USDOI-NPS 1992a:7).

Criterion D: Has yielded, or may be likely to yield, information important in prehistory or history:

Criterion D is the most common category under which archaeological resources are found to be significant. Like terrestrial archaeological sites, sunken ships may not possess associations or specific characteristics that qualify them under Criteria A, B, or C, but nonetheless may yield important information about past maritime activities through archaeological investigation.

Applicable NPS Bulletins

Nominating Historic Vessels and Shipwrecks to the National Register of Historic Places (USDOI-NPS 1992a)

Five types of historic vessels may be eligible for nomination to the NRHP: floating historic vessels, dry-berthed-vessels, small craft, hulks,

and shipwrecks. Floating historic vessels are usually longer than 40 ft (12 m) long and weigh over 20 tons and are maintained on the water. Dry-berthed vessels are out of the water in dry dock or near the waterfront. Small craft are usually less than 40 ft (12 m), weigh less than 20 tons. Hulks are relatively intact vessels that are abandoned near the shoreline. Shipwrecks are submerged or buried vessels that may be relatively intact and recognizable as a vessel, or they may consist of scatters of debris and structural members (USDOI-NPS 1992a:2-3). For more information on nominating a shipwreck to the NRHP, refer to National Register Bulletin 20*, Nominating Historic Vessels and Shipwrecks to the National Register of Historic Places* (USDOI-NPS 1992a)

Guidelines for Evaluating and Documenting Historic Aids to Navigation (USDOI-NPS 1992b)

There are seven types of historic aids to navigation (ATON) that can be considered for listing on the NRHP: manned lighthouses, unmanned lighthouses, sound signals, range lights, daymarks, lightships, and buoys. Manned lighthouses include accommodations for their caretakers. Unmanned lighthouses are small towers that do not require constant monitoring and therefore have no caretakers. Sound signals include foghorns, which typically worked in tandem with a manned lighthouse. Range lights consist of two lights set at either end of a harbor or channel to mark the entrance. Daymarks are visible markers that guide mariners during daylight. Lightships are floating light stations moored offshore where lighthouse construction is not feasible. Buoys are moored floating objects that have specific shapes to warn mariners of hidden dangers. For more information on nominating ATONs to the NRHP refer to *National Register Bulletin 34: Guidelines for Evaluating and Documenting Historic Aids to Navigation* (USDOI-NPS 1992b).

Guidelines for Evaluating and Documenting Historic Aviation Properties (USDOI-NPS 1998)

Aircraft and other aviation-related structures may be discovered underwater and warrant consideration for listing on the NRHP. Aviation wrecks and air terminals on the water may be encountered during cultural resource surveys. Aviation wrecks are defined as any aircraft that has "crashed, ditched, damaged, stranded or abandoned" (USDOI-NPS 1998:20). Air terminals for seaplanes may consist of anchorages, decks, docks, piers, and ramps. For more information on nominating Aviation Properties to the NRHP, refer to *National Register Bulletin: Guidelines for Evaluating and Documenting Historic Aviation Properties* (USDOI-NPS 1998).

Assessing NRHP Integrity—The Seven Aspects of Integrity

Seven aspects of integrity can contribute to the significance of submerged cultural resources, and hence to successful nominations to the NRHP.

Location

Location is the place where a particular vessel was constructed or where a historic event involving a vessel occurred. The relationship between a historic property and its location is an important factor in understanding why a vessel was created or why events happened in that particular location. To have integrity of location, the vessel must have some connection to a port of call, construction, or to the place where a historic event occurred. Such properties may preserve the feeling of historic events, and even of individuals involved in historic events. Location differs from the setting aspect, in that setting means a vessel is maintained in the water (USDOI-NPS 1992a:8).

Setting

Setting is the physical environment of a historic property that encapsulates both the natural and cultural space in which a vessel is located. While location refers to the specific locus of a property or an event, setting refers to the character of the place in which the property is located. Generally, if a vessel is maintained in a waterfront setting, then it possesses integrity of setting (USDOI-NPS 1992a:8-9). However, the setting must not detract from appreciating the vessel as a historic watercraft. How a vessel made use of piers, wharfs, docks, locks, canals, channels, and other maritime and landscape features plays a decisive role in determining whether the integrity

of setting has been maintained. The vessel under consideration must maintain a temporal or cultural affiliation with its surroundings.

Materials

Materials are the physical constituents that were combined to form a historic property during a particular period of time and in a particular configuration. The materials reveal the decisions made by the creators, reflecting variables such as availability, technology, economics, traditions, as well as innovations. Integrity of materials may be retained when structural members were replaced using the same material as the original. If modern materials were used for repairs to a vessel, the repairs should not detract from its historic sense.

Workmanship

Workmanship is the physical evidence of the crafts a particular culture or people employed during a specific period. It is the evidence of artisanal labor, skill, and the use of quality materials in constructing or altering a vessel or structure. Workmanship can apply to the property as a whole or to its individual components. It can be expressed in vernacular methods, formal configurations and ornamental details, or innovative period techniques. Workmanship also may provide evidence of the technology and aesthetic principles of individual, local, regional, or national maritime traditions. Workmanship is interpreted through the physical evidence of the techniques and materials used in ship and maritime infrastructure construction. Integrity of workmanship is maintained when vessel components are replaced or repaired in a historically accurate manner. For example, double-sawn timber frames must be replaced by the same to maintain integrity of workmanship (USDOI-NPS 1992a:9).

Feeling

Integrity of feeling is the ability of a property to convey an aesthetic or historic sense of a particular period. It results from the presence of physical features that impart the historic character of the property. For example, a ship retaining its original design, materials, workmanship, and setting can relate the feeling of long voyages to distant shores in the past. Since this aspect of integrity is somewhat subjective, other aspects of integrity also must be present in order to convey significance (USDOI-NPS 1992a: 9).

Design

NPS describes the concept of design as the "combination of elements that create the form, plan, space, structure, and style of a property" (NPS 2002). It is the result of decisions made during the conception, planning, and construction of a property, as well as alterations to it. Design includes such elements as organization of space, proportion, scale, technology, ornamentation, and materials. Design often reflects the historic functions, technologies, and aesthetics of a period.

Vessels that are repaired with historically accurate materials may retain their eligibility. Alterations made because of a change in owner or industry may nonetheless maintain the vessel's eligibility if those owners or trades were themselves significant. Heavily restored vessels retain their integrity when craftsmanship, use of materials, hull form, rig, and other attributes are maintained; however, whenever possible, the original materials should be preserved. These materials contribute to the vessel's integrity.

Association

Integrity of association relies on physical attributes along with setting to communicate a connection with the past. It is the ability to link important historic events and persons to a historic property. A property retains association when it remains at the original location of events, and is sufficiently preserved to convey that relationship. Like integrity of feeling, association requires extant attributes, location, and setting to convey the historic character of the property. A vessel can possess associative integrity if it is located at a historic waterfront appropriate to the vessel. If the vessel is removed from the water or displayed away from the water, it loses associative integrity.

Summary

Shipwrecks can be significant on local, state, and national levels and reflect patterns of economic and technological development, important people, and social trends on each of these scales. The seven aspects of integrity (location,

design, setting, materials, workmanship, feeling, and association) all pertain to physical and associative attributes, and to the ability to demonstrate the significance of the shipwreck. As discussed above, shipwrecks may be classified as structures or archaeological sites. Although most shipwrecks are nominated under Criterion D for their ability to yield information important to our history, or Criterion C for their engineering importance, some shipwrecks may qualify for listing under Criterion A, for their association with historic events, or under Criterion B, for their association with the lives of significant persons.

Chapter V

Concluding Observations

The preceding chapters of this report have provided a comparative framework for understanding the substance and scope of guidelines for underwater archaeological surveys across multiple state and federal jurisdictions. A guide to the nature of underwater construction activities, the equipment used to implement them, and the range of potential effects to submerged historic properties that can result also has been provided. That discussion and Table III-1, which address the spatial extent of potential impacts, provide a key both to anticipating project effects and to ascertaining the APE for the various classes of construction activities. As stressed above, adequate definition of an APE on a project-by-project basis is a necessary precursor to cultural resources planning and scope development. A synoptic guide to application of the National Register of Historic Places Criteria for Evaluation (36 CFR 60.4) to shipwreck sites, including both the criteria for significance and the measures of integrity, is included in Chapter IV to assist in making determinations of eligibility for submerged resources encountered during future compliance surveys. Such determinations for shipwrecks are somewhat nuanced, especially with regard to integrity, since ships are not static like other classes of structures. The discussion in Chapter IV also addresses the proper classification of property types. That chapter cross-references the vessel typology presented in the Google Earth (© 2018 Google LLC) or ESRI ArcMap-readable geodatabase, which contains information on submerged cultural resources in Long Island Sound and adjacent waters (R. Christopher Goodwin & Associates, Inc. 2018).

The data provided in Chapters III and IV, then, provide toolkits for application by the CT SHPO in project review, definition of the APE, in scoping compliance surveys, and in subsequent assessment of significance and integrity, i.e., NRHP eligibility. Similarly, the discussion in Chapter II frames the management of submerged cultural resources by the CT SHPO by leveraging the best practices of state and federal programs and the broad consensus across jurisdictions on survey protocols.

These discussions reiterate that the CT SHPO needs to approach project planning for submerged resource surveys and inventories on a case-by-case basis. In addition to adopting and applying industry best practices as minimum requirements for remote sensing surveys, Connecticut needs to manage risk for actions that may affect submerged cultural resources by exercising its administrative authority, thereby ensuring appropriate levels of work. Through adoption of these guidelines, the CT SHPO will ensure adequate data acquisition, analysis, and interpretation as part of the compliance process. Sufficient compliance oversight presupposes consultation before initiation of surveys *and* application and enforcement of appropriate permit requirements. Connecticut also will benefit from adopting a consistent process and general guidelines for such work. By addressing the process for submerged cultural resources compliance studies, professional qualifications standards, survey protocols, the remote sensing equipment array, reporting requirements including spatial and metadata standards, project sponsors and their contractors (e.g., archaeologists) can be provided with well-defined procedures and a clearly demarcated path toward compliance. By requiring consultation on the front end of each project, and review and approval of work plans, applicants also are afforded an opportunity to provide new information on innovations in industry best practices, such as the implementation of new technologies that inevitably will be used first in the geophysical survey industry.

Proposed Guidelines Drawn from Phase I Survey

Draft guidelines for submerged cultural resources investigations are contained in Attachment I to this report. Key points of these proposed guidelines include:

- Thirty days advance written notification has been given by the permit applicant to the Native American Heritage Advisory Council, requesting review;
- The CT SHPO will review and act, in consultation with the State Archaeologist as appropriate, upon all complete permit applications within 60 working days;
- The applicant shall provide the CT SHPO with:
    - a written and illustrated project description, schedule and research plan that describes the undertaking and the purpose of the proposed archaeological investigation;
    - a description of the maximum extent of bottom-disturbing activities (horizontal and vertical extents, types of activities contributing to bottom-disturbance, etc.)
    - the estimated timing and duration of field research;
    - the field methods and investigative strategies that will be employed;
    - background research to characterize the types of resources that may be present in the APE;
    - laboratory tests and analytical methods that may be used;
    - a complete project schedule, including anticipated dates for submittal of draft and final reports and related deliverables.
    - To receive an archaeological permit, a PI must possess the stated professional qualifications;
    - The applicant must conduct the survey with equipment and line-spacing that meets or exceeds the minimum specifications, and;
    - The applicant must produce a report and provide data and metadata to the CT SHPO in the specified formats.

Finally, it is recognized that the CT SHPO, like its counterparts in New York, New Jersey, and Delaware, the region that incurred maximum damages from Hurricane Sandy, does not currently employ a qualified marine archaeologist. Therefore, review of projects and federal undertakings necessarily will be handled by the existing staff. While the tools provided herein will assist the review and compliance process by the CT SHPO staff by framing data needs, providing guidance on the range of effects of classes of construction, outlining steps for evaluating submerged cultural resources, and establishing guidelines in draft form for consideration and future implementation, it also should be expected that technical issues may arise requiring input from a practiced and qualified marine archaeologist. The SHPO offices of many coastal states do not employ marine archaeologists, and the only substantive program of note in New England, Massachusetts' BUAR, is not attached to that state's SHPO office. Nevertheless, the CT SHPO would be well served by establishing collaborative relationships with one or more sister agencies that have the appropriate specialist(s) on board. In addition to BUAR, the program of the State of Maryland, MHT, has provided guidance and input on marine archaeological projects and even hosted consultation meetings with applicants jointly with the DE SHPO staff for undertakings in Delaware state waters. MHT underwater archaeologists are willing to serve as a resource to the CT SHPO if needed (Troy Nowak, personal communication, 2018). Furthermore, other such resources no doubt are available from friendly SHPO offices on an ad hoc basis. In the alternative, the assistance of the National Council of State Historic Preservation Officers could be sought in formalizing a cooperative agreement should such be necessary.

The CT SHPO's measure of success in review and compliance for underwater construction projects will at a minimum ensure that no historic properties are damaged or destroyed. Coupled with the careful and *de novo* review of each application, the guidance provided in this document will help foster that objective.

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ATTACHMENT I

GUIDELINES FOR CONDUCTING SUBMERGED CULTURAL RESOURCE COMPLIANCE STUDIES IN CONNECTICUT

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GUIDELINES FOR CONDUCTING SECTION 106 SUBMERGED CULTURAL RESOURCE COMPLIANCE STUDIES IN CONNECTICUT

CONTROLLING DEPARTMENT

A. Connecticut Department of Economic & Community Development, State Historic Preservation Office (CT SHPO)

PERMITTING DEPARTMENT

Archaeological Permits

A. Any person may apply in writing to the CT SHPO for a permit to conduct archaeological field studies on state lands including water bottoms. The CT SHPO shall review and act as appropriate upon all complete permit applications within 60 working days of receipt.
B. The applicant shall provide to the satisfaction of the CT SHPO a written project schedule and research plan that describes the nature of the project and purpose of the proposed archaeological investigation; the estimated timing and duration of field research; the field methods and investigative strategies to be employed; laboratory tests and analyses that may be used; and a justification as to why archaeological resources located within the study area should be investigated.
C. No permit shall be required for the use of metal detectors or similar electronic detection apparatus at state-owned beach areas. All such activity shall be conducted in accordance with Connecticut Department of Environmental Protection, Bureau of Outdoor Recreation current directives and regulations.
D. No permit shall be issued for any field investigation, or excavation, or both, located on state lands or on a state archaeological preserve that would disturb a known Native American cemetery, burial site, or other sacred site as defined in Section 10-381(5) of the Connecticut General Statutes.

Professional Qualifications

A. To receive an archaeological permit, a Principal Investigator must possess the following professional qualifications:

- Meet or Exceed the Secretary of the Interior's Professional Qualifications Standards in Archeology and hold a graduate degree, from an accredited institution of higher learning, in archaeology, anthropology, or a closely related field;
- Have at least sixteen months of professional experience or specialized training in underwater archeology including at least six months of experience in a supervisory role in underwater archaeology; and
- At least six months field and laboratory experience in sites and materials of the type and period of the site that will be investigated (e.g.: six months experience in historical archaeology if the site is historical; or six months experience in prehistoric archaeology if the site is pre-contact).

B. A person lacking the prerequisite training and experience required above may file for a permit for archaeological investigation on state lands provided that a Principal Investigator meeting the above requirements countersigns the permit application. Both the sponsor and the Principal Investigator shall be responsible for all permit-related research and performance standards noted in subsequent sections.

Pre-Survey Coordination with SHPO and State Archaeologist

Applicants should coordinate with the SHPO prior to the initiation of any survey activities through the preparation and submittal of a work (survey) plan, and explication of the work plan at a pre-survey meeting. Pre-Survey coordination may include, but is not limited to, discussions regarding:

- Maximum expected extent of bottom-disturbing activities (horizontal and vertical extents, types of activities contributing to bottom-disturbance, etc.);
- Identification of the APE (Area of Potential Effect);
- Site-specific considerations;
- Field techniques and equipment;
- Data processing and analysis;
- Data and information to be submitted;
- Research to characterize the types of resources that may be present in the APE.

HIGH-RESOLUTION GEOPHYSICAL SURVEY TOOLS

Depending on the area and extent of proposed disturbance, the SHPO may require a geophysical survey that includes the following:

- *Side scan sonar*. The sonar system must be capable of resolving small, discrete targets 0.5 meters (m) (1.6 feet [ft]) in length at maximum range. The instrument range should be set to provide at least 100 per-cent overlapping coverage (i.e., 200 per-cent seafloor coverage) between adjacent lines.
- *Marine magnetometer*. The altitude of the magnetometer should be continuously recorded during data acquisition along all survey transects. Magnetometer sensitivity should be 1.0 gamma (γ; 1.0 nano-Tesla [nT]) or less. Background noise level should not exceed a total of 3.0 γ peak to peak. The data sampling rate should be greater than 4.0 Hz to ensure sufficient data point density.
- *Sub-bottom profiler.* As a minimum standard, the sub-bottom profiler system employed should be capable of achieving a resolution of vertical bed separation of at least 0.3 m (0.98 ft) in the uppermost 10 to 15 m (32.8 to 49.2 ft) of sediments, depending on the substrate.
- *Single beam bathymetry*. The system should provide continuous profiles of the seabed area affected by the proposed undertaking.
- *Multibeam Echo Sounder and/or Phase Differencing Bathymetric (Interferometric).*The bathymetry system must provide full coverage with 100 per-cent overlapping data (i.e. 200 per cent coverage).
- *DGPS/GNSS.* The positioning system should be capable of achieving <5.0 m (<16.4 ft) accuracy. All systems should interface with the navigation system.
    - The horizontal reference is State Plane NAD-83, CT-600 Connecticut, in U.S. Survey Feet.
    - The vertical reference is the North American Vertical Datum of 1988 (NAVD88) using Geoid12A, in feet.

The equipment enumerated above has proven useful for identifying significant submerged cultural resources. Geophysical survey is intended to locate cultural resources that may be impacted by the proposed undertaking. Alternative instruments and techniques may provide valuable data and should be discussed during the pre-survey meeting with the SHPO. The applicant should provide the SHPO with recommendations for avoidance of areas that may contain cultural resources. If avoidance is not possible, mitigation strategies will be determined in consultation with the SHPO.

Trackline Spacing

- Side scan sonar, multibeam echo sounding, and Interferometric transects should be spaced to produce 100 per cent overlapping coverage (200 per cent seafloor coverage).
- Magnetometer and Sub-bottom Profiler transects should be spaced a maximum 15 m (50.0 ft) apart inshore/nearshore, and a maximum 30 m (98.0 ft) apart offshore.

PHASE II AND III GUIDELINES

If the SHPO determines that Phase II or Phase III investigations are warranted, Remote Operated Vehicle (ROV) work and/or manned diving operations (i.e., SCUBA or Surface Supplied Air diving), should follow regulations established by the Occupational Safety and Health Administration (i.e., 29 CFR 1910 subpart T- Commercial Diving Operations) and the United States Coast Guard (USCG) (46 CFR, Chapter I, Part 197, Subpart B - Commercial Diving Operations). In addition to OSHA and the USCG, a wide range of agencies and organizations have established mandatory practices and procedures:

- American Society of Civil Engineers (Childs 2009)
- United States Environmental Protection Agency (EPA) (2016)
- United States Department of Commerce, NOAA (2017)
- USACE (2014)
- United States Navy (USN) (2018)

REPORT GUIDELINES

Two hard copies of the draft and final reports should be submitted to the CT SHPO. In addition, the following items should be incorporated into maps or tables in the report and submitted to the SHPO on CD- or DVD-ROM in the computer data formats described below:

Project Area and APE

The location of the proposed project area and APE should be submitted in an ArcGIS-readable format Shapefile (*.shp), polyline, or polygon boundaries. Cultural resources inventories should be clipped to the boundary of the APE.

Navigation Data

The navigation post-plot of the surveyed area, including survey track lines, line numbers or other designations, navigational event points (event markers), and other relevant attributes should be submitted

in an ArcGIS-readable format. The acceptable formats include: Microsoft Excel (*.xlsx), Comma Separated Value (*.csv), text file (*.txt), database (*.dbf), and Shapefile (*.shp).

Bathymetry Data

The bathymetric data should be provided in the following formats with appropriate metadata detailing processing parameters, illumination angles and coordinate systems:

- XYZ data (i.e., *.xlsx, *.csv, *.txt) or ESRI Shapefile with an attribute table containing all position corrected bathymetric data;
- ARC ASCII Grid and layer files;
- Contours (ESRI compatible shapefile) - 0.5 m (1.64 ft) in water depths shallower than 50 m (164 ft) and 1 m (3.3 ft) or better than 2 per cent of water depth resolution in water depths beyond 50 m (164 ft);
- MBES and Interferometric data fully corrected for tides, sound speed, vessel offsets, draft, and dynamic draft and prepared in mosaics prepared as a geo-referenced Tagged Image Format (.tif) and output as 0.25 m (0.83 ft) resolution or better.

Magnetometer Data

The information used to create the table of magnetic anomalies and chart of magnetic anomalies should be submitted in an ArcGIS-readable format. The acceptable formats include: Microsoft Excel (*.xlsx), Comma Separated Value (*.csv), Text file (*.txt), Database (*.dbf), or Shapefile (*.shp). The following attributes should be included:

- Anomaly ID;
- Project Area;
- Survey line number;
- Event (Navigation);
- Towfish altitude (i.e., height above the seafloor [ft]);
- Signature (i.e., dipole, positive (+) or negative (-) monopole, or complex signature;
- Amplitude;
- Duration (feet or meters);
- Coordinates in State Plane NAD-83, CT-600 Connecticut, in US Survey Feet;
- Associated Magnetic Anomalies and Side Scan Sonar Contacts;
- Identification (e.g., pipeline, geology, cable, etc.);
- Target Number;
- Minimum Recommended Avoidance Distance.

The data should be accompanied by a description of the data processing procedures including filtering for de-spiking, contamination removal (i.e., passing ships), and noise reduction (i.e., regional and diurnal effects).

Side Scan Sonar Data

The information used to create the table of side scan sonar contacts and the chart of sonar contacts should be submitted in an ArcGIS-readable format. The acceptable formats include: Microsoft Excel (*.xlsx), Comma Separated Value (*.csv), Text file (*.txt), Database (*.dbf), or Shapefile (*.shp). The following attributes should be included:

- SSS Contact Number (unique ID);
- Project Area;
- Coordinates in State Plane NAD-83, CT-600 Connecticut, in US Survey Feet;
- Description / Identification (e.g., oblong object, pipeline, cable, etc.);
- Length (ft or m);
- Width (ft or m);
- Height (ft or m);
- Associated Magnetic Anomalies and Side Scan Sonar Contacts;
- Target Number;
- Minimum Recommended Avoidance Distance.

Side scan sonar mosaics of the survey area should be prepared as a geo-referenced Tagged Image Format (*.tif) and output at a 0.25 m resolution or better.

Sub-bottom Profiler Data

The information used to create the table/chart of subsurface landscape features should be submitted in an ArcGIS readable format. The acceptable formats include: Microsoft Excel (*.xlsx), Comma Separated Value (*.csv), Text file (*.txt), Database (*.dbf), or Shapefile (*.shp). The following attributes should be included:

- Feature Number (unique ID);
- Project Area;
- Track line number;
- Filename;
- Axis Start Event;
- Axis End Event;

- Coordinates in State Plane NAD-83, CT-600 Connecticut, in US Survey Feet;
- Axis Width (ft or m);
- Axis Depth (ft or m);
- Description (txt) – internal structure;
- Associated Magnetic Anomalies and Side Scan Sonar Contacts;
- Target (feature) Number;
- Minimum Recommended Avoidance Distance.

Metadata

Metadata for all geospatial data should be validated against the Federal Geographic Data Committee (FGDC) Content Standard for Digital Geospatial Metadata, Version 2 (FGDC- STD-001-1998).

ATTACHMENT I REFERENCES

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