HISTORIC PRESERVATION SERIES #18

SURVEY METHODS

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The Office of History and Archaeology (OHA) is the State of Alaska's primary office with knowledge and expertise in historic preservation and is dedicated to preserving and interpreting Alaska's past. The Office serves as Alaska's State Historic Preservation Office (SHPO) pursuant to the National Historic Preservation Act of 1966 (NHPA), and administers programs authorized by both the NHPA[1] and the Alaska Historic Preservation Act of 1971 [(AHPA) AS 41.35].[2] Both laws authorize the office to carry out numerous responsibilities, including providing advice and technical assistance to federal and state agencies, project proponents, local governments, Tribes, other consulting parties, and the public. To assist with providing consistent guidance and address issues encountered in project implementation, OHA/SHPO developed the Historic Preservation Series as a reference and mechanism to connect people with answers to common questions and/or concerns.

The Historic Preservation series (HPS) is intended to provide guidance on best practices for cultural resource professionals in Alaska. The HPS is not intended to serve as a new level of regulation, but aims to ensure that investigations meet existing state and federal regulations, SCRIP stipulations, and current practices of the discipline by promoting consistency in methods and submittals.

Survey Methods and Best Practices

Archaeological Survey is aimed at identifying and recording evidence of past human activity. A survey should result in an inventory of the surveyed area with a compilation of identified properties. For Section 106 compliance projects, this inventory must include evaluations of each property within the APE (see *HPS 7, Determinations of Eligibility*). The intensity of survey is reflected in the survey coverage (such as transect intervals, percentage of APE covered, etc.), and subsurface testing strategies utilized. Field crews must be led by an SOI-qualified archaeologist with 6 months of supervisory experience in Alaska.

The process of determining appropriate field methods is driven by project objectives, informed by the pre-fieldwork literature review (see *HPS 17, Literature Review*), and must be explicitly defined in the research design (see *HPS 12, Research Design*). The scope and scale of the project for which the archaeological field investigation is being conducted dictate the required level of investigative effort for the survey. In general, there is a correlation between the level of ground disturbance involved in the

[1] For any project, activity, or program funded by or under the jurisdiction of a Federal agency; any project receiving Federal financial assistance; and those requiring a Federal permit, license, or approval.
[2] For projects with any kind of state involvement. This includes any public construction or public improvement project undertaken by the state, or by a governmental agency of the state or by a private person under contract with or licensed by the state or agency of the state.

project and the level of identification required, though other factors (e.g., previous disturbances, specific topographical or hydrological aspects of the environment, depositional conditions) can also influence what field methods are appropriate. For Section 106 compliance projects, the sponsoring agency is typically responsible for determining the level of effort required for their project to meet the "reasonable and good faith effort" requirement of NHPA 36 CFR 800.4(b).

In general, survey types can be divided into two categories: Reconnaissance and Field Survey (sometimes called Intensive Survey). Field survey is distinguished from Reconnaissance by the level of investigative effort, which in practice means the use of subsurface testing.

Reconnaissance surveys are rarely considered sufficient on projects in areas where archaeological sites are likely to occur and/or where the project includes ground disturbance. As such, Reconnaissance methods should primarily be considered tools to inform expectations for a sequential Field Survey.

I. Reconnaissance surveys

A reconnaissance survey is a "once over lightly" inspection of an area, most useful for characterizing its resources in general and for developing a basis for deciding how to organize and orient more detailed survey efforts. Information gathered during a reconnaissance survey may be used alongside a comprehensive literature review to produce archaeological predictive and sensitivity models for a project area (see *HPS 12 Research Design*). Reconnaissance surveys may be conducted on the ground or from the air/using aerial datasets.

> Keep in mind that reconnaissance survey methods alone cannot gather sufficient data for preparing Determinations of Eligibility for the National Register of Historic Places (DOEs).

A) Ground Reconnaissance

This may include a pedestrian field survey with only minimal testing, or a windshield survey.

Pedestrian field survey performed for reconnaissance purposes consists of a walking over of a project area to form a baseline of preliminary expectations for archaeological potential. Reconnaissance-level field survey is often classified as "unsystematic," meaning that a predetermined survey strategy is not followed. It relies on the professional judgment of the archaeologist to survey areas based on their knowledge of regional environmental parameters and known site distributions.

Ground reconnaissance survey is typically focused on identifying the presence of surface sites, areas where subsurface testing will be necessary to identify buried sites, and areas of previous significant disturbance where survival of cultural resources is not expected.

A windshield survey is often conducted for the evaluation of historic buildings and their context within their surrounding community. Considerations include the general distribution of buildings, structures, and neighborhoods representing different architectural styles, periods, and modes of construction.

B) Aerial Reconnaissance

Aerial reconnaissance primarily functions as a guide for more intensive pedestrian survey, by identifying landforms that are considered to have a high probability for archaeological sites based on regional trends identified in the pre-field literature review (see *HPS 12, Research Design* and *HPS 17, Literature Review*).

While aerial reconnaissance is typically associated with survey via aircraft, one may be able to achieve comparable general impressions of landscape topography from a Geographic Information System (GIS). Aerial reconnaissance may consist of a desktop review of datasets such as topographic maps, satellite imagery, or LiDAR for landscape-level analysis. This type of reconnaissance can be considered part of the pre-field Literature Review (see *HPS 17, Literature Review*). Where projects will involve ground disturbance, features interpreted from aerial imagery and LiDAR, such as historic structures and house pits, must be groundtruthed.

An aerial inspection of a project area via aircraft (by helicopter, not fixed-wing aircraft) involves flying over an area at a low altitude to confirm observations about general topography and landscape characteristics. Aerial reconnaissance via helicopter is most effective for identifying surface features that are visible from the air, such as large rock alignments (hunting blinds, drive lines, inuksuk/cairns), the remains of historic buildings, and large house-pit depressions in open landscapes, and "blow-outs" likely to expose subsurface cultural horizons. Altitude, airspeed, and transect width should be justified in the research design and appropriate to the goals of the survey. For surveys intending to identify surface features, typical altitudes for helicopter reconnaissance range from 20-40m above terrain surface, airspeed from 30-80 mph, and transect widths from 200-400m to achieve adequate visual coverage of an area.

Projects covering large areas of survey (e.g., on the North Slope) rely heavily upon helicopters for transport to and from the field, a process that can constitute aerial reconnaissance. The process of surveying the Alaskan landscape via aircraft alone does not constitute an adequate level of investigative effort for projects that will involve ground disturbance. These large projects require sufficient pedestrian coverage of appropriate landforms and natural exposures to support the conclusions of the resulting survey report.

II. Field Survey: Survey with testing

Field surveys for many projects, including Section 106 compliance projects and projects involving ground disturbance, require a higher level of investigative effort, and therefore higher intensity survey methods than reconnaissance survey methods alone can provide. Survey methodology must be explicitly defined in the research design and sufficient to meet project objectives. Rather than assert that survey will proceed in the field at the discretion of the archaeologist, a research design should provide details to explain how the survey will be conducted, and why those methods are suitable to the project area.

Due to a variety of logistical factors, fieldwork in Alaska often combines Phase I and Phase II survey (see *HPS 11, Cultural Resource Investigations*); in these cases, survey methods must not only be sufficient to inventory sites in an area but also acquire sufficient data about those sites to prepare DOEs (see *HPS 7, Determinations of Eligibility*).

A) Surface Coverage

Systematic field survey consists of pedestrian survey along transects of the project area. Transect spacing is limited by vegetation and surface visibility, but should be spaced no greater than 10 m apart if the survey is to constitute a good-faith effort to identify cultural resources. Areas that are considered to have a high probability for identifiable cultural resources should receive greater scrutiny.

The designation of "high probability" carries different implications for traditional pedestrian survey than for predictive models, as defined in *HPS 12 Research Design*. In a Field Survey context, high probability is simply an expression of the archaeologist's professional judgement. This judgement of what specific environmental conditions, landscape features, and contexts will be considered “high probability” areas must be explicitly defined in the research design, informed by the literature review process, and justified in the final report.

Some projects may be ideally suited for the addition of remote sensing techniques, serving as non-invasive surface survey methods that can aid in the identification of anomalous subsurface features that warrant additional subsurface testing. Ground-penetrating radar can highlight potential burials, building foundations, and other features. Metal detectors can be an invaluable tool for identifying historic sites, and more powerful magnetometers have proven successful at identifying discrete subsurface hearth features where previous surveys had found no evidence of archaeological sites. As technology and associated field methods improve, field verification of potentially cultural signals with subsurface testing remains a necessary part of the remote sensing process. Further guidance and recommendations on the use of these methods will be covered in a forthcoming HPS document on Remote Sensing.

Despite background research conducted during the literature review (*HPS 17*), conditions on the ground cannot always be anticipated, therefore survey methodologies should also be flexible. Changes based on unanticipated conditions must be discussed in the report. Significant changes should be made in consultation with OHA.

SHOULD YOU…Conduct winter fieldwork?

> Keep in mind that winter fieldwork presents additional challenges due to limited hours/levels of natural light, frozen ground, and snow cover, which may prevent the discovery and recognition of surface sites. Winter fieldwork is not recommended if there are other options available, including postponing fieldwork until the following spring. Investigators must consult with OHA prior to starting or continuing fieldwork in such conditions.

1) Field Notes

Field Notes often represent the only record of on-the-ground activities and observations for a survey project, and are necessary for both report writing and later clarification of survey findings. Notes also serve a role in recording details about survey execution and should include dates and members of the crew present on a given day.

Management of field data begins prior to fieldwork. Naming/ID conventions for shovel tests, sites, and other features should be set and followed by the whole field crew so as to maintain consistency between the records of individual crew members. Field notebooks are part of the permanent record and should be kept professional and relevant.

SHOULD YOU…use forms instead of field notebooks?

The key is that all relevant data, particularly from destructive activities (testing) is recorded and curated. While traditional field notebooks can be sufficient, they can be inconsistent across crew members and details can easily be missed. Consider using standardized forms for survey, site and feature recordation, excavation, etc.

All members of a field crew are expected to maintain daily field notes, recording observations of anything that might have an impact on that day's work. This could be weather, such as rain or overcast skies that make soil classification or charcoal identification more difficult. Other observations can later inform site interpretation: are there strong winds, or is the location sheltered? What types of vegetation are present, and do they suggest recent disturbance? What landscape features are visible, is freshwater nearby, etc. Redundancy (multiple crew members recording their own observations of the same thing) is beneficial, reducing the risk of lost survey data and capturing multiple perspectives. Following fieldwork, notes should be digitized/typed for legibility and longevity.

Identified surface collections and subsurface sites should be well-documented in field notes, including:

- Descriptions of site locations
- Photos and sketch maps of the site and landscape context
- Depositional/erosional environment
- Site stratigraphy
- Soil descriptions
- Artifact descriptions, photos and/or sketches
- Artifact provenience and distributions
  - Shovel test/excavation unit number
  - Date of excavation
  - Excavator's initials linking it to field notes
  - Stratigraphic context
    - Horizontal and vertical location and orientation
    - Relationships to any associated features
- Coordinates of all subsurface tests. This includes positive and negative shovel tests, and subsurface probes/auger locations. These should also be included in table format in decimal degrees in the final report.

While recording redundancy provides security, care should be taken that recorded coordinates for surface finds and subsurface tests are identical when recorded by multiple crew members, to prevent a feature or subsurface test from being reported in multiple locations during post-field analysis.

2) Use of GPS (Global Positioning Systems)

Field surveys should make use of GPS units for recording individual survey tracks and the locations of identified cultural resources. Survey tracks and resource locations should be included in maps of the surveyed project area in the final reporting, demonstrating the execution of the field methodology detailed in the research design.

Keep in Mind: unless near a large community, do not expect cell coverage in the field!

Areas with substantial tree canopy cover or significant topographic variation may have limited GPS signal, and by extension, less precision for recorded coordinates of site or artifact locations. OHA recommends the use of the "waypoint averaging" feature, which involves allowing the GPS to collect additional location estimates over a short range of time (from 20 seconds to a minute or so in cases of extremely poor signal). This feature is commonly available on GPS units (including lower-power handheld Garmins) and can achieve higher confidence in data precision and accuracy.

In your final report, provide specifics on the GPS units/receivers/data collection devices used in the field, and the accuracy of the GPS receiver used (ideally, have sub-meter accuracy). Ensure that sufficient data is collected and reported for the Alaska Heritage Resources Survey (AHRS) and adheres to National standards for geospatial data collection (e.g., DOI NPS Cultural Resource Spatial Data Standards: https://www.nps.gov/crgis/crgis_standards.htm).

3) General Field Safety

Remote fieldwork in Alaska may subject field crews to numerous hazards, from general tripping/falling hazards to bear encounters, and unexpected changes in weather which may cause crews to become stranded in the field for days at a time. Survey methodology should address anticipated safety concerns and solutions in the research design. Though OHA does not take a specific stance on predator deterrents, carrying multiple options for crew safety is highly recommended based on the types of predators that may be encountered, and the time of year the fieldwork will take place in proximity to predator habitat. OHA recommends field crews comprise at least two individuals and include the use of GPS. For remote fieldwork, multiple forms of communication (Satellite Phone, Satellite texting service such as inReach, radios, etc.) should be employed to maintain daily contact between the field and a support base. Ensure communication devices work *before* heading into the field, and make sure the batteries are sufficient or can be charged in the field. Field crews should have access to first aid kits and relevant training to employ them.

4) Surface Sites

All surface exposures within a project area should be inspected, including but not limited to deflated dunes and ridgelines, blowouts, eroding river or tidal banks, tree throws, trails (whether the investigator believes them game or human trails), and any other areas devoid of vegetation where subsurface deposits are exposed.

In some landscape contexts, artifacts may be identifiable on the surface. Surface scatters may vary from a single piece of lithic debitage to a diverse combination of flakes and diagnostic artifacts, and can incorporate features like hearths, tent rings, or historic structures. Surface scatters may occur as small discreet exposures, or be spread diffusely over large areas. OHA expects diagnostic artifacts to be collected for permanent curation via the pre-arranged curation agreement. Uncollected non-diagnostic artifacts should be left in their original contexts.

Subsurface testing (see below) is necessary to assess whether a surface site is associated with intact buried cultural deposits. At a minimum, an overview photo and sketch map of the general distributions and a list/summary of what was found should be reported for each surface scatter. One method for producing a sketch map involves establishing a grid over the area and documenting finds based on grid units (such as one square meter). Precise mapping of individual artifacts is only required for diagnostic artifacts. Modern GIS data collection equipment is excellent at establishing the precise location of objects and features. However, sketch maps and photographs are useful tools for capturing the spatial relationships between objects, natural features, and the broader landscape. A DOE may need to be written for the site, so sufficient information should be gathered for an evaluation to be prepared without revisiting the location.

B) Subsurface Testing

Survey of all areas of the APE where ground disturbance is anticipated should include some form of subsurface testing. OHA expects Field Survey to include subsurface shovel testing, covered below. If the Field Supervisor determines subsurface testing is not warranted, the survey report must provide an explanation and images showing why subsurface testing was not appropriate. The final report must also justify any in-field deviations from the field methodology approved in the research design.

1) Purpose of Testing

Survey and Testing goals vary based on the needs of the project. The most fundamental purpose of testing is to identify evidence of past human activity. This includes metal, lithic, and organic artifacts, faunal and floral material, and features such as hearths, cache pits, or remnants of structures. Diagnostic artifacts can help estimate the age range of site occupation relative to established timeframes and cultural contexts developed through analysis of similar sites. Identifying patterns in the distribution of different types of artifacts and features can help infer which kinds of activities were carried out at a site, and potentially the times of year that the site was occupied. The future research potential of specimens found at a site should be discussed in the final report.

In general, testing is intended to rule out the potential for subsurface archaeological sites that could be affected by a project. This can be directly related to the depth of anticipated ground disturbance. For example, if a project will result in ground disturbance up to a meter in depth below the surface, archaeological testing should aim to identify potential sites at least that deep, unless tests encounter strata that predate the arrival of humans in Alaska or are impenetrable. Where permafrost or otherwise frozen ground prevents sufficient testing, un-investigated depths should be considered *not* cleared for cultural resources and should be associated with vertical buffers limiting ground-disturbing activities unless accompanied by an archaeological monitor. As permafrost may be encountered at relatively shallow depths, this may result in a relatively shallow vertical buffer.

Another goal of testing is to provide context for identified sites, particularly subsurface sites, through consideration of site stratigraphy. This includes information related to the occupation and subsequent reoccupation of the site (cultural formation processes) as well as natural formation processes that drove landscape development prior to site occupation (deglaciation, soil development, etc.) and following site abandonment (sediment erosion or deposition, bioturbation, cryoturbation, natural chemical processes related to soil development, etc.). Reconstruction of these processes helps to relate the observed evidence of an archaeological site to the human activity responsible for it.

For example, is the site associated with a paleosol, indicative of a period of stability that allowed vegetation and soil development? Did human occupation occur on or mixed within glacial till, suggesting an early postglacial site? Did human activity take place during a period of intense sediment accumulation, as on loess dune formations? After site abandonment, was it quickly buried by sediments, implying a potential for good preservation of organic material and artifact distributions? Does the site appear to have been disturbed by rising tides, river flooding, disturbance by plant roots or animal burrows, freeze-thaw cycles or other processes that would impact the preservation and physical integrity (vertical and horizontal context of artifact locations) within the site?

2) Determining Site Boundaries

Establishing site boundaries is an important step in the process of site identification and evaluation. There are two primary means for determining site boundaries.

The first is based on clearly definable geomorphic factors, such as the natural extent of an occupied landform (a knoll or terrace edge) or the limiting presence of physical landscape features such as a river or lake. These factors are used to make the assumption that previous human activity was spatially constrained.

The second method, determining the horizontal extent of archaeological material through testing is necessary where the absence of landform edges does not provide natural constraints on human activity. This is normally done through subsurface testing but may be partially augmented by observance of exposures. In general, site boundaries should be drawn to capture the known extent of archaeological material, and include a buffer of no less than 10 meters to mitigate potential investigative and recording error.

Ideally, these two methods are combined to avoid excessive damage to the site through unnecessary testing. Archaeological sites are finite resources: testing of identified sites must strike a balance between the acquisition of sufficient data to prepare a DOE and destructive subsurface testing within the site. Some sites that are very spatially constrained may be so small or ephemeral that excessive testing may significantly affect a site's integrity, or destabilize the site location (such as a small knoll, or area subject to significant erosion). Other sites may require additional testing to verify the assumption that human activity was limited to the definable landform. For example, at a hunting overlook site, general day-to-day activities may have taken place in the shelter of the landform rather than on the exposed landform crest, where lithic debitage is readily recognizable on the surface.

One method for determining site boundaries requiring only minimal disturbance to the site itself is to conduct shovel tests from the edge of the suspected site boundary (i.e., general geomorphic boundaries) towards the known part of the site, rather than extending shovel tests from the positive shovel tests outward. Keep in mind that all material recovered through subsurface testing must be analyzed for the final report - testing in excess of what is required to address a site's eligibility for the National Register increases the amount of material that must still be analyzed.

When establishing site boundaries, how much testing is too much testing?

Testing is inherently destructive. Consider testing from the outside of the likely boundary in towards the site to minimize impact.

Decisions for methods and determinations of site boundaries should be explained in the final report. As a DOE may need to be written for the site, sufficient information should be gathered for an evaluation to be prepared without revisiting the location.

3) Shovel Testing Specifics

Shovel tests must be 50 x 50 cm square, though for the purposes of evaluating a site for eligibility to the National Register, larger dimensions may be necessary. Shovel test orientation should be North-South when possible. Shovel tests must be dug by either natural or defined arbitrary levels, with artifacts collected by those levels. Arbitrary level depths must be defined and justified. Though referred to as shovel testing, OHA expects careful excavation of apparent cultural horizons by hand-troweling with an aim to identify artifacts and features in situ, providing a better context for recovered material.

To aid in the consideration of site formation processes, soil stratigraphy visible in shovel test walls should be documented through profile drawings and photographs, and include descriptions of sediment type, color, clast size, moisture content, and other notable characteristics. Light conditions can make shovel test photography difficult, and issues with photograph clarity may not be noticed until post-field processing. For this reason, good profile sketches remain important. Various methods for profiling are used in Alaska, but in general profile sketches should be clear, accurate, and communicate relevant information about site stratigraphy.

Best Practices: Example

> Negative shovel tests in a given area should be included in field notes and in the final report with at least representative sketches and sediment descriptions, as they provide useful background information and serve as controls for shovel tests that are considered positive. For example, negative shovel tests are necessary for determining site boundaries, but can also provide controls for faunal signatures, disturbance processes, natural forest fires, and other signals that might otherwise be interpreted as direct evidence for human activity.

Shovel test termination must be justified. In general, shovel tests should proceed until they no longer can (i.e., they encounter bedrock or permafrost) or until they have reached depths at which the potential for past human activity can be ruled out (i.e., encountering strata that predate the arrival of humans in Alaska). The research design should specify these anticipated sterile strata when possible, such as bedrock or glacial till. Determination that a shovel test has reached sterile strata must be justified by excavation at least 10 cm into sediment that does not contain any evidence of human activity (lithic or faunal material, charcoal, etc.). This includes glacial till, coastal gravel deposits, and similar contexts where previous human activity may have taken place within or immediately above those layers. This also includes locations where presumed sterile deposits may only be thin laminations overlying intact sediments that could retain evidence of previous human occupations, such as sites along river terraces or lower floodplains that may have been subjected to periods of alluvial deposition during flooding or brief meandering of the river.

Winter fieldwork is occasionally necessary, but such work is expected to follow the same standards as warm-season work, including subsurface testing and screening. Winter conditions are rarely an adequate reason for the use of heavy equipment to perform Phase I and II level investigations unless emergency situations occur. Prior approval from OHA and the sponsoring agency is required when artificial heating methods will be employed to thaw in situ frozen ground, and consideration should be given to the effect of such methods on near-surface and/or organic artifacts, features, and radiocarbon dates. These methods are not recommended if there are other options available, including postponing fieldwork until the following spring.

4) Site Dating

OHA does not expect every project to budget for direct dating of *every* identified site, but whenever possible the investigator is expected to collect relevant material from identified sites that could be used to date it in the future. Radiocarbon dating is the most common method used to determine the absolute age of an archaeological site, which can be a consideration for determining a site's significance or mitigation plan. Given the expanding number of affordable radiocarbon labs within the US, when possible, radiocarbon dates should be obtained using Accelerator Mass Spectrometry (AMS). When present, wood charcoal is the preferred sample type collected.

Regardless of what type of material is collected for dating, the sampling strategy and confidence in the reported date should be discussed in the final report. Dated material should be as directly associated with or relevant to the period of human activity as possible. Wood charcoal identified and recovered in situ from hearth features is typically considered ideal, though the investigator should consider whether the dated material was short-lived and likely to date to the period of hearth use (e.g., twigs). This helps avoid the potential for dating long-dead material, which would produce ages predating the period of human activity. This problem is called the "old wood effect" and can be especially relevant in settings where wood from previous structures may have been salvaged centuries later for use in the current site, or where long-lived coastal driftwood may have been burned in hearths. The need to consider the association between the age of the dated material and the age of human activity applies to many materials, from marine mammal bone, fish bone and marine shells influenced by the marine reservoir effect to large mammal bone or ivory that may have been scavenged from natural deposits for tool production.

To report radiocarbon dates, standard practice is to include the uncorrected date as well as the calibrated age range rounded to the nearest ten along with the calibration curve used, the lab and lab number of the sample, and the specific context/provenance of the sample within the site.

5) Screening

Sediment excavated from shovel tests must be screened by shovel test and by level to retain some stratigraphic context for recovered artifacts. OHA expects screens with 1/8-inch mesh to be used whenever possible, as 1/4-inch screens are likely to miss small pieces of debitage, including microblade fragments, small historic items like beads, and relevant pieces of faunal material like fish and small mammal bone. Note that these smaller artifacts are also more fragile: recovery from 1/8-inch mesh requires that efficient screening also be conducted with care. OHA recognizes that sediments in some of Alaska's environments are not conducive to screening through 1/8-inch mesh. If a screen size larger than 1/8-inch is to be used, it must be explained in the research design *and* final report. In some conditions, use of a deliberate subsampling strategy or water-screening (in consultation with OHA) may be advisable or even necessary for site identification, depending upon the anticipated material culture.

SHOULD YOU…use ¼-inch screens?

Some sediments, such as those with high clay content or rich in saturated organic material, cannot effectively be screened through 1/8-inch screen mesh. In those cases, directly address your choice to use ¼-inch screens in both your research design and final report.

6) Artifact Collection

All artifacts removed from their original context (i.e., those excavated during subsurface testing) should be collected and curated according to the pre-arranged curation agreement with an OHA-approved curation facility (typically the University of Alaska Museum, the State Repository). Each artifact must be assigned a unique find number in the field, and be accompanied by enough information to contextualize its location during later analysis and digitized copies of field notes. For artifacts recovered in situ, this includes:

- Site designation
- Shovel test/excavation unit
- Date of excavation
- Excavator's initials linking it to field notes
- Stratigraphic context (provenience)
    - Horizontal and vertical location and orientation
    - Relationships to any associated features

The investigator may choose to remove specific features such as hearths in their entirety for later analysis. Artifacts from dense aggregations (such as debitage or faunal remains) in a single context may be collected in defined groups (e.g., collect debitage in groups of 3 cm clusters, rather than bagging 500 small flakes individually).

Artifacts identified during screening should be collected by level. Relevant notes about artifact distributions should be recorded in field notes.

7) Other Subsurface Testing Methods: Soil Probes/Cores

Other less invasive forms of subsurface testing facilitate the identification of subsurface soil horizons but are not a replacement for shovel testing. Soil probes, cores, and hand augers provide significantly less of the subsurface for visual inspection and as such are insufficient to "clear" an area as having no historic properties present. These testing methods may be able to identify the presence of deep paleosols or subsurface charcoal deposits, but do not represent sufficient coverage to support a determination of no sites present or no historic properties affected for Section 106 compliance projects.

Identification of a potential site via these methods must be groundtruthed with shovel testing to validate site identification. For example, the recovery of deeply buried charcoal in a soil probe may suggest a subsurface site, but further testing is necessary to clarify whether that charcoal represents a distinct site or a larger landscape fire (whether environmental or anthropogenic in origin). This can be achieved with shovel testing through the identification of anthropogenic soils (such as unnaturally greasy, charcoal-rich layers produced by sea-mammal or fish processing) or the identification of artifacts, and by conducting shovel tests nearby to confirm that subsurface charcoal is only in a small, localized area.

C) Deep Testing

1) Purpose of Deep Testing

The goal of Deep Testing is to identify buried cultural horizons and relevant soil formation processes that could be missed by conventional testing methods (i.e., shovel tests of ~1m in depth), representing an effort to determine if a project's ground disturbance could affect significant, deeply buried sites. If not conducted, the inadvertent discovery of deeply buried archaeological sites during a project's ground-disturbing activities will cause lengthy and costly delays due to the additional difficulties associated with archaeological data recovery at such sites. Inadvertent discovery can also result in the loss of significant data: cultural horizons that are deeply buried under substantial amounts of sediment have a greater potential to be undisturbed and, consequently, could exhibit greater preservation of organic materials and retain precise contextual information. A number of the oldest archaeological sites in Alaska have been discovered through deliberate Deep Testing, but many important sites of similar age across Alaska have been identified only after partial destruction, visible in roadside cut-banks.

When is Deep Testing Necessary?

Deep Testing should be considered early in environments where older sites might be deeply buried. Where a project is likely to cause deep enough disturbance to impact a potential deeply buried site, prior Deep Testing is *required*.

Due to the higher level of effort required to conduct Deep Testing, it is critical that investigators recognize where Deep Testing may be required and account for it at the earliest possible stage in fieldwork planning. Determining whether Deep Testing is warranted is based on an evaluation of past human behavior combined with Holocene depositional processes. Locations that were likely to have been favorable for human activity in the past and have experienced periods of high aeolian sediment deposition (wind-blown sediment) over the last ~15,000 years will typically require greater effort to identify deeply buried subsurface cultural horizons. Investigators should not rely solely on geologic maps to determine locations and potential depths of sediments, as these products provide only broad overviews of surficial geology and geomorphic features. The decision to conduct Deep Testing should be anticipated in the research design, informed by the literature review, and supported by visual inspection of landforms in the field. Where Deep Testing may be warranted, investigators should include in their crew or consult with geoarchaeologists or similar specialists in geomorphology.

The most common high-deposition environments are in proximity to braided streams or shorelines with unvegetated banks or sand bars. In central Alaska, other environment types warranting Deep Testing include loess dune fields and drained paleolakes. These developed rapidly in the terminal Pleistocene and throughout the Holocene due to the deposition of sediment activated by both glacial retreat and the drainage of glacial lakes at the end of the Last Glacial Maximum. Other types of depositional environments, such as colluvial (down-slope movement) deposits, deep tephra near volcanic sources, or deposits of anthropogenic origin can also result in deeply buried, but still intact, cultural horizons.

There are a number of methods for conducting Deep Testing, representing different points of balance between resolution in data collection and time spent in excavation. Several will be covered below, including expanded shovel testing, augering, and machine excavation. Other powerful geophysical techniques to aid Deep Testing, such as Ground-Penetrating Radar, Resistivity, and Magnetic-Susceptibility, are becoming increasingly popular in CRM, but are not reviewed here.

2) Deep Shovel Testing

Typical surveys with shovel testing should anticipate encountering certain sterile sediments (commonly glacial till in Alaska) or bedrock to determine at what depth a shovel test should be terminated. The need for Deep Testing can be verified in the field upon reaching depths beyond typical testing methods, i.e., around one meter in depth, without encountering sediments that would justify shovel test termination. The use of soil cores or bucket augers at the bottom of a one-meter-deep shovel test can help determine the potential depth and composition of underlying soils.

As an example, if the literature review suggests that the project area may have been a vegetated dune field at points throughout the Holocene, the specific testing location is on a prominent landform, and subsurface tests continue to encounter deep, well-bedded deposits of sands and fine silts, there is ample justification that Deep Testing will be necessary to identify deeply buried cultural horizons at that location.

Deep Testing with shovels should be conducted to OSHA standards, including width to depth ratio of the trench, the use of hard hats and safety vests, etc. Typically, a 1x2 m excavation unit two meters deep requires a surrounding 3x4 m in excavation to one meter deep. Though these deposits may appear to be highly stable, safety must always be the primary concern.

Standard methods involve skim shoveling and screening excavated sediment. Identification of a cultural horizon through the recovery of a few pieces of debitage or other artifacts should trigger a shift to hand-troweling through the cultural horizon. The decision to quickly remove substantial layers of overburden without screening must be made in consultation with OHA.

The oldest known sites in Alaska are found in high depositional environments in central Alaska, with lower cultural components commonly between 1.5 and 2m below the surface, and as deep as 4m below the surface. Deep testing should be conducted until the potential for buried cultural horizons can be ruled out, either through encountering bedrock or identifying soil horizons that predate the arrival of humans in the region. This requires knowledge of how long humans have occupied the region (at least 14,000 years in the Tanana Valley) and the ability to discern the potential age of sediments in the field. Note that the apparent late arrival of humans in certain parts of Alaska may simply be a combination of preservation bias and insufficient Deep Testing.

Best Practices: Deep Testing and Frozen Ground

Encountering permafrost is a common challenge for Deep Testing in Alaska. Where Deep Testing is warranted, but justifiably cannot be conducted for safety or physical reasons (permafrost), un-investigated depths should be considered *not* cleared for cultural resources and should be associated with vertical buffers limiting ground-disturbing activities unless accompanied by an archaeological monitor. As permafrost may be encountered at relatively shallow depths, this may result in a relatively shallow vertical buffer.

3) Auger Use

Augers are most useful in areas where the potential for Deep Testing is identified. Where a shovel test reaches ~1m in depth without reaching bedrock or sterile sediments (glacial sediments, or those predating the arrival of humans in AK), an auger test placed at the bottom of a 1 m deep shovel test can provide information informing further Deep Testing with expanded shovel tests, see above.

Due to the speed and potential mixing of subsurface stratigraphic contexts caused by mechanical or hand augering, it should only be conducted following prior approval of the planned methodology by OHA. One limitation of auger use is the inability to visually inspect profiles. It is difficult to identify subsurface features using these methods, and it may not be possible to determine or describe impenetrable strata at core/auger termination (encountering permafrost, bedrock, large gravels, tree roots, etc.). Where auger use is approved through consultation with OHA, it remains insufficient to rule out the presence of a site, and potentially identified sites must be groundtruthed with shovel testing to validate site identification.

4) Machine Excavation

Machine excavation via excavation equipment (i.e., backhoe) is a destructive process and the logistics of machine excavation greatly limit where it can be conducted, however, it can be an effective technique for Deep Testing if conducted with care. Two basic approaches can be taken: rapid excavation of a trench to expose a profile to investigate, or the systematic excavation of deposits with an excavator. Trenching provides an opportunity for an archaeologist to quickly identify potential cultural horizons or contexts that may indicate a higher likelihood for a cultural horizon (a paleosol) in the trench profile prior to more widespread destructive excavation. Systematic excavation may be justified where clearly defined disturbance has occurred in the recent past, already eliminating the possibility of intact cultural deposits (e.g., previous highway construction fill). Identification of artifacts related to that disturbance may still be necessary to contextualize the timing of that activity.

Given the destructive nature of machine excavation, consideration of its use and the proper approach must be made on a case-by-case basis. At a minimum, all excavation should be monitored by a qualified archaeologist. All deposits should be systematically removed in pre-established levels when possible. Control over the removed deposits should be managed in such a manner that if a discovery is made, the deposits associated with it are readily identifiable and can be further inspected and screened if possible. All cultural materials recovered must be collected with as much accuracy as possible relative to where in the resulting profile they originated.