Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Cultural Resources Study

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

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(sensitive location information has been removed from this document to facilitate public distribution)

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LIST OF ACRONYMS AND SCIENTIFIC LABELS

Abbreviation	Definition
ADNR	Alaska Department of Natural Resources
AEA	Alaska Energy Authority
AHRS	Alaska Heritage Resource Survey
ANCSA	Alaska Native Claims Settlement Act
APA	Alaska Power Authority
APE	Area of Potential Effect
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
cmbs	Centimeters Below Surface
CRS	Cultural Resources Study
FASL	Feet Above Sea Level
FERC	Federal Energy Regulatory Commission
GIS	Geographical Information Systems
GPS	Global Positioning System
ILP	Integrated Licensing Process
MTRS	Meridian, Township, Range, Section
NAD27 & NAD83	North American Datum 1927 & 1983
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
OHA	Office of History and Archaeology
PAD	Pre-Application Document
PRGCI	Pacific Rim Geological Consulting, Inc.
RM	River mile(s) referencing those of the 1980s APA Project.
SHPO	State Historic Preservation Office
tN	True North
USGS	United States Geological Survey

Restriction Statement

A more complete version of this report containing the locations of cultural resources was prepared and submitted to oversight agencies and landowners to facilitate environmental and engineering planning efforts. Under the provisions of the Archaeological Resources Protection Act and the National Historic Preservation Act, site location information is restricted; disclosure of such information is exempt from requests under federal and state freedom of information laws. With specific site location information removed, this report now becomes a public document. It is submitted as partial fulfillment of cultural resources permit agreements with the Federal Energy Regulatory Commission (FERC) Section 106 Consultation Authorization #14241-000; Bureau of Land Management (BLM) Permit for Investigations and Fieldwork Authorization AKAA-093320; State of Alaska Field Archaeology Permit 2012-17; and Tyonek Native Corporation Land Use Permit 20121306-05. It is intended for release to the BLM, FERC Alaska Energy Authority (AEA), the Alaska Office of History and Archaeology, the State Historic Preservation Office, and affected Native entities.

SUMMARY

Purpose

The main goal of the 2012 field season was to begin inventory of the known cultural resources within the Project area. Part of this involved a screening of potential paleontological resources in the area. A second goal of the cultural resource study was to conduct subsurface testing in areas of high and low archaeological potential. The purpose overall was to inventory and evaluate the significance of previously identify cultural and paleontological resources in the Project area. The 2012 field work consisted of the Cultural Resource Study Lead and two technicians surveying for 17 days.

2012 Accomplishments

The 2012 work included synthesizing the existing location data for known State of Alaska Heritage Resources Survey (AHRS) sites, mapping the existing AHRS site locations along with environmental variables, identifying previous (early 1980s-era) survey coverage, determining existing and baseline place names within the study area, mapping known land use and site distribution in order to develop an archaeological locational model, acquiring and updating early 1980s-era records and ANCSA 14(h)(1) property information, and preparing a plan for inadvertent discoveries. Paleontological research focused upon summarizing existing information and developing a site location model. All the tasks intended in 2012 were accomplished. In addition, locations near the dam site selected for exploratory drilling by AEA were investigated and determined to lack cultural resources, enabling the geotechnical investigation.

Applications of 2012 Data

The 2012 field results primarily concern the nature and location of known AHRS sites, and the nature and location of newly discovered sites. This information will be used to refine the archaeological locational model for further testing in the continuing studies in 2013 and 2014, and to help refine the survey strategies. The improved model applicability and more informed survey strategies will improve sampling confidence and research efficiency when conducting the 2013-2014 archaeological inventory and evaluation.

Important Findings:

Within the Project area there were previously 115 recorded cultural sites, and the 2012 survey resulted in the discovery of three more. Of the 115 known sites, 25 were revisited in 2012. Of the total of 28 sites documented, 19 were on federal land, three were on state land, and six were on CIRI land (survey on Tyonek land resulted in no site observations). The impoundment and all three access corridors were sampled in 2012.

The potential for undiscovered sites in areas unsurveyed or lightly surveyed during the early 1980s-era work was confirmed. Of the three new sites found in 2012, two were identified by surface observation and the third was found only through exploratory testing. Each contained one or more prehistoric stone artifacts.

The paleontological background research identified about 100 known fossil find localities in the region, of which three are in the impoundment and 12 are in access corridors.

1. INTRODUCTION

This report has been prepared for the Alaska Energy Authority (AEA), which is licensing the Susitna-Watana Hydroelectric Project (Project) using Federal Energy Regulatory Commission (FERC) Integrated Licensing Process (ILP). The Project's dam site will be located at River Mile (RM) 184 on the Susitna River, an approximately 300-mile-long river in the Southcentral Region of Alaska. Federal, state, and private lands are included in the Project Area. Cultural resources investigations are required as part of the environmental studies being conducted for FERC licensing.

Northern Land Use Research, Inc. (NLUR) archaeologists began a cultural resources field inventory for the Susitna-Watana Hydroelectric Project on August 1 to 17, 2012[1], as a central component of the 2012 Cultural Resources Study (CRS). The firm is contracted to URS Corp, which in turn is contracted to AEA to undertake environmental studies for the Project. Results of this study have aided the planning of the 2013-14 formal study program and will help inform the Exhibit E of a license application (18 CFR 4.41), as well as contribute to FERC's National Environmental Policy Act (NEPA) analysis for the Project license. In the field the archaeological crew was guided by the most current Project development plans available at the time. The Project development plans have since changed slightly as a result of further engineering studies, and this report does not reflect those changes; current engineering plans are referenced in the AEA 2013-14 Revised Study Plan (RSP) (AEA 2012).

Construction and operation of the Project as described in the Pre-application Document (PAD; AEA 2011) will affect cultural resources. Cultural resources studies will enable the applicant and lead federal agency to assess any Project-related effects to historic properties under the National Historic Preservation Act (NHPA) and its accompanying regulations (36 CFR 800), and other pertinent federal and state laws and regulations. It will also provide a basis for, as appropriate, developing avoidance and protection measures; defining mitigation and enhancement measures; and preparing resource management and monitoring plans.

There are 118 known cultural resource sites within the 2012 Area of Potential Effect (APE), which is comprised of the Susitna-Watana impoundment area, the Chulitna corridor, the Denali corridor and the Gold Creek corridor (Figure 3-1). The main goal of the 2012 field season was to begin inventory of the known cultural resources in the Project Area and develop a predictive model along with some subsurface testing to help identify areas of high and low archaeological potential. To facilitate these goals, all known sites were incorporated into a geographical information system (GIS) geodatabase prior to fieldwork, and areas of high and low potential were modeled. Study objectives described in the Cultural Resources Data Gap Report (Bowers et al. 2012) are reiterated and summarized in Section 2. The study area is defined in Section 3, and the inventory and testing methods are described in Section 4. Results of the 2012 inventory and limited testing are presented in Section 5, and a discussion and conclusion are contained in Section 6.

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[1] Two archaeologists were deployed on June 7 and again on July 1 to survey geotechnical borehole locations prior to ground disturbance. Those results are presented in Appendix 1.

2. STUDY OBJECTIVES

The primary study objective for the 2012 CRS was to inventory a sample of known cultural resources within the direct APE, in order to better assess the time and effort involved with inventorying the total of known cultural resources. Ten secondary objectives were also identified and listed in the Data Gap Report (Bowers et al. 2012) and the Proposed Study Plan (AEA 2012). This section lists the objectives and describes what was achieved. Work planned for the 2013 and 2014 seasons is also described where applicable.

2.1. Begin inventory of known cultural resources within the direct APE

Study Lead Justin Hays and two crew members began field inventory of known cultural resources in the direct APE. A sample of sites listed in the Alaska Heritage Resource Survey (AHRS) database was visited, and each site was recorded using contemporary archaeological methods. Priority was given to sites within the impoundment area, but portions of each of the three proposed corridors were also surveyed – either by air from a helicopter or by foot. Logistical considerations such as weather and helicopter access determined which sites could be inventoried in 2012. Areas with clusters of sites within hiking distance of one another were favored for pedestrian survey and inventory.

2.2. Synthesize existing location data for known AHRS sites

Because GPS technology was not available during the early-1980s era surveys, locations for known sites in the study area are not precisely recorded. Moreover, narrative location descriptions in the AHRS database are often ambiguous and at times misleading. In order to refine site locations and site descriptions, the original individual site documents were scanned and archived: field journals, site-specific field journals, sketch maps, photographs, slides, and site reports, as well as other primary and secondary documentation. These documents fill 44 boxes in the University of Alaska Museum of the North (Fairbanks) (UAMN) archives. Original USGS maps used in the field with recorded site locations, bearings, and miscellaneous notes written on them were also scanned. All early-1980s era field notes, maps, and associated materials are being compiled into individual site packets for field use during the 2013 and 2014 seasons.

2.3. Map site locations and environmental variables

Known AHRS sites were relocated and mapped to compare their reported locations with their actual locations, to obtain more accurate data for the site locational model, and to help plan the 2013 and 2014 field investigations. The sample size of sites under consideration varied as the definition of the APE evolved in 2012, with fewer known sites captured by the later (October) version of the APE. Site locations were mapped with revised coordinates where possible, resulting in approximately 16 percent of the sites within the APE being updated. New sites were also discovered and mapped. Environmental variables and baseline physiographic data provided by DNR and other agencies as digital datasets were mapped either as raster or vector data. Mapped variables were examined to help plan the 2012 field logistics, to better understand site location attributes, and to compare with the 2012 field results. Environmental variables were compared to *landsat* imagery to assess the accuracy of recorded data when applicable (vegetation, for example).

2.4. Identify previous survey coverage

Between 1978 and 1985, archaeologists conducted cultural resources surveys, testing, and site excavations for the proposed Alaska Power Authority (APA) Susitna Hydroelectric project and ancillary facilities (construction camps, transmission lines, access roads). Collectively the effort is here characterized as the early-1980s era investigations. While the project proposed in the 1980s had a different footprint than the currently proposed Project, much of the two areas overlap. For the earlier project, annual and summary reports described over 270 sites that required some form of analysis and curation of associated artifacts (e.g., Dixon 1985; Dixon et al. 1985; Greiser et al. 1985, 1986). Another 22 previously known sites were revisited and documented. Of the sites found, 111 were found through subsurface testing (resulting from ~ 28,000 shovel tests). About 99 percent of the known cultural resources have yet to be evaluated for their National Register of Historic Places (NRHP) eligibility. Of the known sites, 87 percent have prehistoric remains, two percent have protohistoric remains, 10 percent have historic and modern remains, and two sites (1 percent) have paleontological remains.

2.5. Add existing and baseline place names

Native place name information for the study area has a direct bearing on the understanding of the cultural resource inventory, and initial collection and use of this information was anticipated. Compilation of place name data was not conducted during 2012 but will be part of a comprehensive ethnogeography study in 2013 and 2014, with initial results available for incorporation into the locational model and survey strategy. The place names study is described in more detail in the RSP.

2.6. Identify and map prehistoric resource locations (settlement patterns, historic land use)

Settlement patterns, as reflected by known AHRS site locations, were mapped according to three subsets: prehistoric sites, Native historic sites, and Euro-American sites. Because prehistoric resource locations are hypothesized to be similar but not identical to modern resource locations, mapped resources were generalized by buffering in GIS. Caribou migration patterns and ranges appear to be closely associated with prehistoric settlement patterns; however, additional fieldwork in the APE corridors in 2013-2014 may refine this view, especially based on the results of survey in areas not previously surveyed. Ethnographic information was also assessed in 2012 for insights into protohistoric and Native historic land use. Historic Euro-American land use is represented by sites reflecting early exploration (TLM-020 outside the direct APE), early hydropower (TLM-204), reindeer herding (TLM-113), and railroad development (TLM-005), all of which were mapped to help understand their local relationships to the regional history. Historic mining and trapping locations in the impoundment area were mapped in 2012, and trails were recorded in the APE.

2.7. Develop archaeological locational model prior to fieldwork

Digital data were examined statistically to assess the strength of associations between known dependent variables (site locations) and independent variables such as elevation (23 variables were assessed). The model output is a map of the study area with negative to positive values depicted in 30 m (98 feet) by 30 m (98 feet) units with gradations of color from dark to light;

areas with negative values are considered least likely to hold sites, and areas with positive values are most likely to hold sites. The map was useful for developing survey strategies across the APE prior to fieldwork, particularly for unsurveyed areas.

2.8. Update and retrieve legacy records

A hard-copy inventory was created of documents associated with the 1976-1985 surveys, and the contents were then evaluated for their relevance to the 2012 and 2013-2014 studies. The most useful documents were scanned and digitized, including field journals, all site-specific field notes, all photographs and photologs, survey locale reports, and field area testing reports. All digitized documentation was sorted and compiled by site. For use in GIS, survey locales (Dixon et al. 1980) and survey units (Greiser et al. 1986) were compiled as shapefiles and mapped accordingly.

2.9. Research Bureau of Indian (BIA) 14(h)(1) records

BIA staff was contacted for information regarding Alaska Native Claims Settlement Act (ANCSA) 14(h)(1) sites in the vicinity of the Project APE. A list of 14(h)(1) sites in or near the Project APE was compiled from small-scale maps provided by the BIA's ANCSA office. The NLUR-GIS Department prepared index maps of the Project area for use at BIA, depicting the APE, impoundment area, corridors, trails, and the meridian, township, range, and section (MTRS) on individual USGS quadrangles. Trail information came from a variety of sources including BLM, ADNR, AEA, and the 2012 field observations.

2.10. Summarize paleontological records and develop site location model

Subcontractor Thomas Bundtzen of Pacific Rim Geological Consulting (Fairbanks) performed a geologic literature review of the APE, relying mostly on the early 1980s-era records. Using regional stratigraphy and geochronology, a classification system was developed to help identify likely locations for significant fossil finds. As provided in the RSP, field investigation will take place during the 2013 season.

2.11. Prepare inadvertent discovery plan

A plan was prepared by the cultural resource study team in the event that cultural resources or human remains are incidentally found by AEA's various study teams or other staff and contractors during the 2012-2014 fieldwork. The plan is based around long-standing protocols developed by the SHPO and the Alaska State Troopers, and identifies the involved parties (including land owners and Native tribes), how they are to be notified of discoveries, and when. Protocols for the inadvertent discovery of human remains, in particular, require immediate parallel notification of the SHPO and Alaska State Troopers for their determination as to whether the find is an archaeological matter or a potential crime scene, with copies to the Alaska State Medical Examiner. Information about cultural resource discoveries is channeled according to the type of cultural resource and the specific landowner.

3. STUDY AREA

At the time of the 2012 survey, the study area, encompassed the Watana Reservoir, Watana Construction site, and three potential road and transmission corridors (Chulitna, Denali, and Gold Creek corridors; Figure 3-1). This initial study area consisted of the geographic area or areas where the character or use of historic properties may be altered (directly or indirectly) by construction and operation of the Project. The study area was defined by Geographic Information System (GIS) shapefiles in the project geodatabase provided by the Alaska Department of Natural Resources (ADNR). The total acreage within the study area is 186,275 acres. The impoundment study area is defined by a 45,321-acre polygon, referred to as *Study Area Boundary Elev 2200 ft*, within the aforementioned geodatabase (Figure 3-2). The three proposed access routes differ in length and area: the *Chulitna Project Boundary* is 51.8 miles long and 36,107 acres in area; the *Gold Creek Project Boundary* is 54.7 miles long and 59,750 acres (Figure 3-3) and the *Denali Project Boundary* is 62 miles long and 45,097 acres in area (Figure 3-4).

The study area described above is referred to as the direct APE for 2012 (Figure 3-1), since the APE has been further refined in the RSP. Within the direct APE there are 118 known cultural and paleontological resources (115 previously recorded on the AHRS and three discovered during the 2012 field effort). Site information and locations listed in the AHRS database were sufficient to guide the cultural resources inventory, realizing that undiscovered sites may still exist in previously surveyed areas within the direct APE (three new cultural resources were recorded in areas that had been surveyed in the 1980s). Of the total number of known sites, 15 are in the Chulitna corridor (all prehistoric in age); 14 are in the Denali corridor (13 prehistoric and one paleontological); two are in the Gold Creek corridor (one prehistoric and one historic); and 87 are in the impoundment area (76 prehistoric, six historic, four protohistoric, and one paleontological).

4. METHODS

The results of the 2012 season were expected to help evaluate the accuracy of known site locations and to quantify the effort required to relocate known sites. Site locations were updated in 2012 with GPS and integrated into GIS for the initial inventory.

Prior to the field investigations NLUR developed a locational model to identify areas of high and low potential in the direct APE. Phase I (Inventory) survey and limited testing was conducted in areas of the APE not previously surveyed, in areas that modeled high for the potential occurrence of cultural resources, and in one area that modeled low for cultural resources. GIS-modeled locational surfaces of the direct APE, which incorporate numerous environmental and cultural variables, were categorized by cumulative numerical values. Higher values are areas of higher site potential, and lower values are of lower site potential. Previously recorded information regarding the general study area, as well as specific site descriptions, was reviewed prior to fieldwork. USGS maps and landsat imagery also provided guidance for delineating possible test areas. Systematic sampling was not conducted in 2012 (it will be implemented in the 2013 and 2014 field seasons as provided in the RSP). The importance of testing areas of *both* lower and higher site potential is fundamental for guiding survey efforts; in order to confirm that areas with higher values do indeed hold the most cultural resources, and that areas with lower values do actually contain fewer cultural resources.

During the 2012 field season selected site locations listed in the AHRS database were investigated on the ground by a crew of three people. The crew was transported by a Robinson 44 helicopter to landing zones near clusters of cultural resource sites. The crew then navigated on the ground with the aid of USGS maps and aerial photographs produced in GIS, compass, and GPS formats. Known sites were re-located and recorded with a survey-grade, handheld Trimble® GeoXT™ GeoExplorer® 6000 series GPS. Descriptions were recorded and the site's condition verified and, where appropriate, updated. A metal detector was used to sweep the reported site location in search of buried site datums and/or related materials (e.g., metal spikes, nails, wire, and datum tags) as well as possible historical artifacts.

The 2012 season was dedicated to initiating the site inventory, and so exploratory testing was limited. Sites were given a preliminary assessment of condition, mapped, and photographed. Subsurface testing was not done at known sites, but limited testing was performed in areas of high and low potential as determined by the locational model. Previously unknown sites were recorded to a Phase I (Identification or Inventory) level as defined by the OHA (*Alaska Office of History and Archaeology Historic Preservation Series No. 11, revised 2003)*. Artifacts from all newly discovered sites were collected, cleaned, catalogued and analyzed. Artifacts collected from federal and state lands will eventually be accessioned at the University of Alaska Museum of the North archaeological repository. Tephras, paleosols, charcoal, and bone were also collected when present. Such special samples will be used to help differentiate strata, and organic samples will be radiocarbon dated using the AMS method; bones found will be identified to species if possible.

5. RESULTS

Outcomes of the inventory, testing of areas deemed of high and low archaeological potential, site location modeling, and paleontology literature review are presented below in that order.

5.1. Inventory and newly discovered cultural resources

Study Lead Justin Hays, Archaeologist Mark Rusk, and Archaeological Technician Aurora Bowers began the 2012 archaeological field survey for the Susitna-Watana Hydroelectric Project on August 1. The fieldwork was completed on August 17, with specific goals set forth in the 2012 Proposed Study Plan (AEA 2012) being met. A second field excursion with Mat-Su Borough Archaeologist Fran Seager-Boss was scheduled for September 20, but the trip was canceled due to flooding in the Project Area, and was not rescheduled.

As described in the 2012 Proposed Study Plan, cultural resources within the proposed study area were inventoried based on known site locations in the AHRS database. Sites were visited on the ground or aerial surveyed within all three of the proposed access corridors (Chulitna, Denali, and Gold Creek) and the impoundment area (Table 5.1-1). Weather, wildlife, landing zone availability, site density, and helicopter access/sharing determined daily goals and objectives.

Known AHRS sites were relocated using modern professional-grade GPS equipment. Previously recorded sites were found to be anywhere from 0 to 155 m (0 to 509 feet) from their reported location in the AHRS system. Metal detectors proved to be an important instrument for confirming site location and distinguishing among closely located sites and new, previously unrecorded sites. No systematic patterns of error (such that a correction could be universally applied to all the original location information) can yet be detected from comparing the early locations with the new GPS readings. The average number of sites visited each day during the inventory phase of fieldwork was 3 (Table 5.1-1). It is estimated that a survey crew of six people spaced 10 m (33 feet) apart would be more efficient, especially for transecting landforms with reported cultural resources. Due to the unsystematic and inherent errors in the AHRS database, it is conceivable that one crew could relocate and record two to three known sites per day. Each crew will need a metal detector to search for site datums. Most datums from previous surveys consisted of a buried aluminum tag attached to a 12 inch-long metal spike. However, datums were only recovered at six the 25 known sites visited in 2012. Three were metal spikes and three were wooden stakes with or without nails. Only two had the site name attached to the spike or stake. In most cases, wooden stakes and lathes were observed in varying degrees of decay on the surface of sites or partially concealed by ground vegetation. Some stakes had metal nails on the end that could be detected in dense vegetation with a metal detector.

Of the 28 sites inventoried in 2012 (25 known sites and three newly recorded sites), 19 were on federal lands; three were on state lands, and six were on private lands (all owned by CIRI Corporation). Included are three new cultural resources that were recorded during the inventory phase of fieldwork: HEA-488, HEA-489, and TLM-284. Below is a brief summary of the cultural resources newly recorded in 2012.

<u>HEA-00488</u>

The site is a lithic scatter composed of mainly cortex flakes (debitage). A small fragment of weathered bone was also noted but may not be related to the concentration of stone flakes.

(specific location description removed to allow public distribution)

<u>HEA-00489</u>

The site is on a large esker or moraine. Possible waste flakes of dacite or argillite were mapped on blow-out surfaces. A rusted pack can opener was also observed. The site shows evidence of both prehistoric and modern use.

(specific location description removed to allow public distribution)

<u>TLM-00284</u>

The observed site consists of a single basalt flake located on the trail surface. No subsurface testing was performed, but future testing could better characterize the site.

(specific location description removed to allow public distribution)

The site is situated on a hill with evidence of solifluction. The resulting topography is a series of small terraces and knobs.

5.2. Testing

Cultural resource testing in areas of high and low potential was performed at six locations during the 2012 field season (Table 5.2-1). As stated Section 2.0, the primary goal of 2012 was to begin the field inventory of known cultural resources in the Study area. Testing for the presence of unknown cultural resources was a secondary study goal for the season. Testing had two goals: 1) to aid subsequent field seasons by identifying previously unknown cultural resources in the direct APE and, 2) to inform the theoretical locational model with real data derived from the field that could be integrated into the high and low potential model surfaces. Testing was limited to three full days and two half days of surface and subsurface testing (August 12 to 16). The results of the testing phase of the 2012 investigations are presented below.

IM-JMH-002 was a negative test area on Tyonek land. OHA Special Projects Archaeologist, Dr. Richard VanderHoek accompanied the AEA cultural resources team in accordance with the state field permit stipulation. The test area was in a high potential area west of (location description removed to allow public distribution). The area of the landform deemed to have the highest potential is 274.9 m^2 (2958.6 $feet^2$). AHRS site TLM-180 -- reported to have multiple components and multiple tephras -- is near the site and on the same general landform that the test area is on. Systematic transect survey is warranted along the landform, along with further exploratory testing.

GO-JMH-001 was a negative test area on CIRI land (Figure 5.2-1). The test area in on a broad ridgeline oriented east/west. The landform was modeled as high potential for cultural resources. Two test pits were excavated at this location. The test area is 990.74 m^2 (10,664.14 $feet^2$). The landform is very large and warrants further investigation: systematically transect survey and further testing. An aluminum datum was placed in the ground and flagged for work in 2013 and 2014.

GO-JMH-002 was a negative test area on CIRI land. The test area was placed on a high potential landform that overlooks the Susitna River 1.7 km (1 mi.) to the north and Stephan Lake 3.7 km (2.3 mi.) to the south. There is a steep canyon and river valley to the west of the landform that drains into the middle Susitna. The broad slope is oriented roughly east/west with the eastern-most portion sloping roughly 18^o down towards the river valley. Three test pits were excavated along a systematic grid, spaced 10 m (33 feet) apart. Test pits were excavated to bedrock and the natural stratigraphy was recorded. The test area was 2069.9 m^2 ($22{,}280.4^2$) but could be expanded after systematic ground survey. An aluminum test area datum was placed in the ground and flagged for work in 2013 and 2014.

CH-JMH-001 was a negative test area on federal land. The test area was placed on a substantial and prominent terrace above Portage Creek. The terrace comes to a narrow point on the east/northeast portion of the landform. The test area is 1.6 km (1 mi.) from the confluence of Portage and Thoroughfare Creeks at 229^o tN. A grid was laid out from the point of the terrace, along the narrow terrace edge, at 300^o tN. A second grid was laid out north of the 1^{st} grid; test pits were spaced 5 m (16 feet) apart to maximize coverage on the narrow point. Test pits were excavated to bedrock and the natural stratigraphy was recorded. The test area was 990.7 m^2 (10,664.1 $feet^2$) in size. An aluminum test area datum was placed in the ground and flagged for work in 2013 and 2014.

CH-JMH-002 was a negative test area on state land. The test area was placed on a low potential landform near Swimming Bear Lake. The landform is a relatively flat terrace, moraine, or kame deposit at the base of a steep cliff below the talus slope. The landform was tested to inform the locational model of the presence or absence of cultural resources. The test area is 661 m (2168.6 feet) at 285^o tN to Swimming Bear Lake. A grid was laid out at 106^o tN along the small landform. Test pits were spaced 10 m (33 feet) apart. The small test area was 394.7 m^2 (4248.4

ft^2). The pits were excavated to bedrock and the natural stratigraphy was recorded. An aluminum test area datum was placed in the ground and flagged for work in 2013 and 2014.

DE-JMH-005 (AHRS HEA-00248) was a positive test area on federal land. At the time of testing, the area was considered to be a high potential landform with no previous investigation. The landform is a terrace directly above (location description removed to allow public distribution). The west bank of the terrace is steeply eroded at 42^o slope. A grid was laid out along the edge of the terrace at 260^o tN, directly next to the eroding west bank. Two test pits were positive for cultural resources. Subsurface lithic flakes were recorded above and below the Devil Tephra deposit. Test pits were excavated to bedrock and the natural and cultural stratigraphy were recorded. Preliminary analysis based on only two test pits suggest this site, HEA-248, is a multicomponent site. An aluminum test area datum was placed in the ground and flagged for work in 2013 and 2014.

5.3. Modeling

For the proposed Susitna-Watana Hydroelectric Project (AEA 2012a), a locational model was requested as part of the cultural resources work for aiding archaeologists in locating sites, especially prehistoric sites, within the study area. The reasoning for using models and the basic steps in modeling have been detailed in the Data Gap (Bowers et al. 2012) and RSP, and will not be repeated here. Instead, a brief discussion of determining the extent of the modeled area (which encompasses the APE, but extends beyond it; Figure 5.3-1, 5.3-2), development of variable weights, and use of the model surface for future survey design purposes will be included.

The focus of the 2012 field season was the assessment of effort required for the relocation and inventory of previously located cultural resources. Field efforts as they related to the model were 1) assessing the accuracy of site coordinates, and 2) ground truthing readily observable variables such as vegetation and slope. The results of the 2012 field season were informative for determining the reliability of certain variables, and for considering optimal ways to apply model results more fully in the 2013 and 2014 field seasons during systematic sampling of survey areas. A full discussion of the model will be presented in future reports following its use and tests of efficacy.

Regional environmental data, much of which has been compiled by state and federal agencies, were readily available (see AEA 2012b for list) for formulating the model. Spatial coordinate information, used as the dependent dataset in the model, was extracted from the AHRS. This dataset is compiled from numerous sources by the OHA. Typically, all regional data varies in accuracy and in scale. For modeling purposes, steps were taken to improve comparability, such as rescaling rasters, classifying, and re-coding data. When available, datasets were compared to archived material from earlier surveys (Dixon et al. 1985; Greiser et al.1985, 1986).

Model area

The spatial applicability of the Susitna-Watana model was evaluated primarily by assessing the topographic diversity within the region surrounding the study area. The model includes 10,885 square miles (28,192 km^2) or almost 7 million acres, and contains varing ecosystems. This breadth allows for the most inclusive dataset of prehistoric site types already discovered, which theoretically gives the model the ability to reflect more realistic land use patterns within the region. Major ecozones within the model area are the high mountains and glaciers of the Alaska

Range to the north of the proposed dam area, the highlands of the Talkeetna Mountain Range which surround the dam area, the valleys and lakes of the Susitna River and its tributaries, and lower terrain such as Lake Louise and Susitna Lake with associated wetlands to the east of the proposed dam area. Ethnographic research in the area indicates that several Na-Dene speaking groups of people, including the Ahtna, Den'aina, and Lower Tanana, inhabited this area, using a wide range of flora and fauna. Linguistic data which attests to their inhabitation may be incorporated into future models. According to Kari (2011:248), 15 percent of toponyms in the Ahtna language, for example, refer to human activities on the landscape such as subsistence locations, trails, or material culture. Prehistoric archaeological sites (n=396) in all ecosystems formed the dependent dataset for the model. In the study area, the least surveyed areas are primarily the APE corridors and areas beyond the immediate impoundment; the impoundment area has had focused archaeological survey in the past and has contributed most of the known cultural resource dataset (Dixon et al. 1985). Random points (n=400) generated in ArcGIS software were used as a comparative dependent dataset (Figure 5.3-1).

Model variable weighting

Independent variables overlap spatially, and for the purposes of organizing GIS layers, variables were conceptualized as classes of coded data (see AEA2012b for table of variables). The weighting of variables was based on the statistical relationship of variables (results of Chi Square, Pearson's R and Fishers Exact tests), as well as on professional judgments, the Principal Investigator's knowledge of regional archaeology, and general subarctic human land use. We know prehistoric human land use is linked to all variables chosen for analysis, but with some more or less relevant in decisions regarding placement of settlements or camps, and some more or less readable in the archaeological record (Dixon et al. 1985). In the case of the Susitna region, an example of weighting is provided by the resource variable 'caribou'. Procurement of caribou as a resource appears distinctly significant in the region based on ethnographic, archaeological, and statistical data. Known archaeological site locations are linked spatially with caribou ranges (polygons of ranges provided by Alaska Department of Fish and Game), corroborating the importance of caribou for site location decision-making, with a higher significance for the variable 'caribou-summer' range.

Thus, the variable 'caribou-summer' was weighted heavily, which gives the spatial extent associated with caribou ranges during that season a higher value for site potential (higher cell values in that location), contributing to a lighter color on the final mapped surface. However, this variable is spatially defined from *modern* caribou ranges (as are all independent variables), and additional factors were considered when defining variable spatial extents in the model. Buffers of 5 km (3.1 mi.) were added to caribou ranges both for incorporating possible range variation through time, and also for considering such factors as logistical subsistence strategies (i.e., transporting resources outside the range to camps).

The assessments of linked attributes associated with caribou ranges and migration patterns such as elevation, aspect, and hydrography, which are variables not as subject to change over the millennia as terrestrial mammal movement, also aided in making decisions regarding weighting. In reality, shifts in vegetation, weather patterns, presence of predator species (aside from humans), caribou populations in neighboring regions and a number of other factors all effect caribou summer range and migration patterns through time. While it is difficult to quantify some of these factors for modeling purposes, awareness when weighting variables was integral to reasoning. Buffers (from 1 to 5 km [0.6 to 3.1 mi.]) were also placed on other mobile resource variables including sheep and avian ranges in an attempt to account for range changes over time. Topographic variables were also buffered, such as possible tool stone sources, rivers and lakes, and linear landforms (terraces), in an attempt to recognize prehistoric human mobility patterns related to these resources and the spatial breadth associated beyond the exact resource location.

Model surface

Accordingly, the model surface generated for the Susitna area is a *generalized* depiction of site potential used especially for defining areas with clusters of variables with higher weights. Cumulative weights of the model surface range from -10 to +42 (Figure 5.3-2). As might be expected, the upper and lower extremes of the range of values have the least numbers of cells (raster units) represented on the model surface. The most numerous cells are mid-range values between 0 to -3 and between +14 to +21, giving a bi-modal appearance to the raster cell counts (Figure 5.3-3).

As a check on the construction of the model surface, known prehistoric sites should fall within areas of higher raster values. This is the case, and Figure 5.3-3 shows sites and associated raster values, with a mean raster value of +23 (Figure 5.3-4). Random points should not show this pattern of association with higher values, and this is also the case; mean raster value for random points is +11 (Figure 5.3-5).

The cumulative model surface, when categorized into thirds for analytical purposes results in 38.8 percent of cells in the lowest value range (-10 to +7), 56.2 percent of cells in the middle value ranges (+8 to +25), and 5.0 percent of cells in the highest value ranges (+26 to +42). The highest value range equates to approximately 128,000 acres of the entire modeled area (about 0.01 percent of the modeled area).

Within the current APE (three corridors and the impoundment area), highest cell values represent an area of 34,860 total acres, approximately 35.8 percent of the APE acreage. The majority of this acreage lies within the impoundment area. Other highest value acreage lies within the distant end of the Denali corridor covering a stretch of approximately 16 km (10 mi.), within the western end of Chulitna corridor discontinuously for approximately 27 km (17 mi.), and within the Gold Creek corridor eastern portion for approximately 26 km (16 mi.). A sampling design for appropriate survey of these and other areas is being developed for use in the 2013 and 2014 field seasons. Surveys of areas of moderate and lower site potential will also be included in sampling; the efficacy of the model and verification of model assumptions requires testing outside the areas of highest site potential.

The 2012 field season observations suggest a probable source of error in model efficacy will be due to inaccurate information of variables associated with point locations (coordinates) of existing cultural resources, as well as, the coarse grain of available environmental datasets. Sites located prior to the availability of hand held GPS technology were based on points drawn on paper maps at relatively broad scales (1:24,000 USGS at the finest) and without the benefit of detailed land-satellite imagery. Today, field crews using survey-grade GPS can expect uncorrected, real-time sub-meter accuracy in recording point locations. This inaccuracy of earlier data was confirmed by the 2012 field crew; actual site locations varied from previously recorded locations, with no consistent variation in distance between actual and previously recorded data (Table 5.1-1). The inaccuracy of derived raster variables from these AHRS points, however, is not anticipated to be of great consequence for model results at this time, mainly due to the coarse-grained nature of the all datasets across the study area. As a first iteration, the generalized model surface nonetheless illustrates areas of higher and lower site potential within the study area which is incorporated into the archaeological survey sampling design, and is based on the best available data at this time. It is expected that future iterations can incorporate updated cultural resource data and other datasets as they become available.

5.4. Paleontology

An assessment of known and potential fossil-bearing localities in the Susitna region was conducted by Pacific Rim Geological Consulting, Inc. (PRGCI) through an evaluation of geological terranes and a literature review of previously published paleontological records. Paleontological localities are recorded in federal, state, university, and other professional publications, and a database was compiled which summarizes 100 known fossil localities in the region. Potential for fossil locations on federal lands, which follows the BLM classification system, was also described; no locations were identified as critical or ranked as Class 5 - very high potential. The majority of the study area and immediate surrounding locations were ranked as 2 to 3 - poor to moderate or unknown potential for fossils. At the time of the literature review, PRGCI was only asked to review fossil-bearing locations on Federal lands. As provided in the RSP, other locations on State and private lands will be reviewed in 2013 and 2014 and eventually surveyed should the potential for Project-related effects to fossils exist.

Assessments indicate most known fossil locations are in the east-central and western portions of the region. Seventeen fossil localities are located east of the proposed dam location, 59 are located to the west, and remaining localities are scattered in various sections of the region. Three fossil localities are within the impoundment study area and 12 occur in study area corridors. Fossil locations on federal lands are limited to the northern-most portions of the study area, and a small section of federal lands along the Susitna River from Gracious House on the Denali Highway to the proposed dam location.

5.5. Borehole investigation

After the original study plan for the 2012 field season was prepared and filed, AEA notified the cultural resources study group of 2012 plans to drill eight geotechnical boreholes in the vicinity of the proposed Watana Dam site, near the banks of the Middle Susitna River. Ground disturbance for these geotechnical investigations could not proceed without prior cultural resources survey and assessment of the affected areas and the concurrence of the SHPO. Therefore, at AEA's request, NLUR added this work to the original study plan in order to inspect the borehole locations during the 2012 field season and allow the geotechnical investigation to proceed expeditiously (Appendix). The cultural resources survey was conducted as a Phase II or "Evaluation" survey as defined by the OHA (*Alaska Office of History and Archaeology Historic Preservation Series No. 11, revised 2003*). Such surveys are designed to locate sites in an affected area and gather sufficient information to evaluate the eligibility of sites for listing on the National Register of Historic Places (36 CFR 60). Archaeological fieldwork included on-the-ground pedestrian survey and aerial survey of the APE for the proposed boreholes.

6. DISCUSSION AND CONCLUSION

The 2012 CRS greatly informed our understanding of the project area in terms of the effort necessary to positively determine AHRS site locations. We also learned how valuable metal detectors are for locating shallowly buried site datums and associated modern materials from the sites recorded in the 1980s. Imprecise coordinates of known sites, especially at locations with dense clusters of sites, will need to be thoroughly examined from existing 1980s field notes and maps, and then surveyed on the ground. All of the known sites will need more accurate field coordinates using survey-grade GPS and mapping equipment.

6.1. Site inventory and AHRS location discrepancies

As first noted in the data gap analysis for this project (Bowers et al. 2012), there are discrepancies in site locations recorded in the AHRS versus the actual location of sites on the ground. The use of GPS and GIS analyses in current use were unavailable for most of the previous archaeological work in the Project area, in which researchers were limited to triangulation using USGS maps, compass/tape, or other methods of locating sites. Sites were later hand plotted on paper copies of USGS maps in the OHA office. Therefore, site location in the Study area for many sites is imprecise, ambiguous, and/or inaccurate.

We use the terms 'precision' and 'accuracy' in very specific ways in this report. 'Precision' refers to measurement scale only, and is defined as "the refinement used in taking a measurement, the quality of an instrument, the repeatability of the measurement, and the finest or least count of the measuring device" (Moffit and Bouchard 1975:11). For instance, a site location at a certain coordinate is more 'precise' than the same site located at 'near the junction of the X and Y rivers.' 'Accuracy' refers to the real versus the documented location, and is defined as "an indication of how close [a measurement] is to the true value of the quantity that has been measured" (Moffit and Bouchard 1975:11). A position nearer to the actual location of the site is considered more accurate. For our purposes, this accuracy can only be assessed and analyzed using primary documents such as field notes, original survey maps, and the like. Truly accurate site locations require precise field measurements with calibrated instruments.

Problems with AHRS site locations are not unique to this project. A review by NLUR of data gaps associated with the proposed Denali Gas Pipeline found that of 73 sites compared, there was an average discrepancy of 24.9 m (81.7 feet), with a minimum of 2.37 and maximum of 124.6 m (408.7 feet). Fifty percent of the sites were offset by 10 to 30 m (33 to 98 feet) (Bowers et al. 2008).

Our findings substantiate those of Reanier, who in 2002 surveyed Alyeska Pipeline sites and observed that, "….our concerns regarding AHRS site locational accuracy appear to have been well founded. We were able to estimate the discrepancy between the AHRS location and the actual location [measured using high precision sub meter accuracy GPS] for 53 archaeological and historic sites. For these sites the average error was 209 m with a minimum error of 10 m [33 ft.] and a maximum error of 2,067 m [6781.4 ft.]" (Reanier 2003:4).

In Table 5.1-1 we list AHRS sites, coordinates as shown in the AHRS, and the discrepancy between the recorded position and our field verified position. As shown, site locations vary between zero and 155.43 m (509.94 feet) with an average discrepancy of 46.5 m (152.6.feet).

Discrepancies can be resolved in the field resulting in better data, more efficient field seasons, and lower costs.

6.2. Testing in the study area

The margin of error of the 1980s coordinates in the AHRS database fluctuated from a few meters to over a hundred meters. Orientation to/from the sites was inconsistent with no logical pattern of error. Metal detection at all sites proved to be the best method for relocating site datums; however, often no site name or number was recovered from metal datum spikes. In sum, sites were relocated using a combination of GPS, AHRS coordinates and site description, metal detection, and general archaeological training (e.g., interpreting natural and cultural landforms in the field).

Due to the short field season, no designated testing crew(s), a total of 18 test pits in six test areas, and little stratigraphic information to draw from, conclusions from the 2012 fieldwork must remain provisional and subject to further refinement. The testing phase of the project within the 2012 study area has helped orient the cultural resources team to the direct APE in general. Surface and subsurface observations at this point are only cursory glimpses into the natural and cultural landscape of the area. The 2013-2014 effort will involve further adjustments to maintain the most efficient testing protocols for the Project, as set forth in the RSP.

6.3. Technological advancements in analysis, methods, and modeling

More than a quarter century of modern archaeological research, aided by new methods and technology in GPS and GIS, geoarchaeology, geochronology, stratigraphic analysis, lithic and faunal analysis, and ice patch research, have taken place in Alaska since the original Susitna work. Research in Southcentral and Interior Alaskan river drainages has demonstrated that the prehistoric cultural chronology and dynamics are far more complex than was believed (Dixon 1985). Of major pertinence, modern advances in radiometric dating techniques require a review of the radiocarbon dates from the Project area, as set forth in the RSP.

The Project cultural resources data gap report (Bowers et al. 2012) summarizes the available literature about cultural resources in the Project area, and reviews the cultural resources reports prepared during the 1978 to 1985 environmental studies. Data gaps identified include inadequacies in the location information of sites due largely to improvements in field and mapping methods since the 1980s (GIS, portable GPS units, better topographic maps, and datum transformation from NAD 27 to NAD 83), and advances with survey methodologies compared to those employed during the earlier research. The cultural chronology of the Project area needs re-examination, as set forth in AEA's RSP.

Predictive models as research tools are not new to archaeology (cf. Judge and Sebastian 1988; Aldenderfer and Maschner 1996; Wescott and Brandon 2000). The earlier legacy studies also utilized predictive model frameworks for approaching surveys of the Susitna region. What is new for current studies is the availability of regional digital datasets with greater standardization of scale across the area, and the use of GIS technologies which increase the flexibility of models as spatial tools. In many ways, the attempts to understand the region then and now are based on similar assumptions regarding land use, the relationships between cultural variables and environmental variables. The current model is an updated, more detailed and more flexible version of an approach used for examining land use and site potential. This first pass at determining which variables are helpful for considering presence of cultural resources confirms what archaeologists have already noted (i.e., importance of resources, landforms, elevation), and this is due to the use of known sites for deriving associated values. Testing the model during the 2013 and 2014 field season by applying it especially to areas previously unsurveyed, as explained in the RSP, will likely provide information for refining the weighting of variables and increasing our understanding of associations between prehistoric site locations and the landscape, and for assessing effects of the proposed Project on cultural resources.

6.4. Paleontology in the Study Area

Paleontological information compiled by PRGCI includes valuable data regarding the region's deep past, represented by recorded species of fossilized flora and fauna, and observations of geological change within the region. For example, fossils of species which lived exclusively in warm, equatorial environments illustrate global tectonic terrane shifts across geologic time as manifested within the Wrangellia Terrane, which is present within part of the impoundment study area. In the western Susitna region the Cantwell Formation sedimentary facies have yielded dinosaur foot and skin prints; this Formation has not been thoroughly assessed for paleontological resources.

Relevant to understanding spatial distribution of cultural resources are Quaternary age deposits, which, by PRGCI estimates, cover about 30 percent of the region. These are mainly re-deposited materials, primarily of glacial origin. Paleontological materials associated with Late Quaternary and Early Holocene deposits in other parts of the state often represent mega fauna, such as *Mammuthus* and *Bison spp.* which were potentially present within the time span of human prehistory, and in some cases are found in association with cultural materials (Holmes et al 1996). Mammoth remains have been located in the Tyone River mouth area, and in the northern portion of the region. In addition, Quaternary age deposits are important indicators of sequences of deglaciation, which are of course relevant for understanding the development of paleoenvironments and habitability of the Susitna region. According to PRGCI and other researchers studying the terminal Pleistocene, glaciers receded in the region earlier than previously thought, which has obvious implications for time depths of potential cultural resources.

7. REFERENCES

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8. TABLES

Table 5.1-1. Number of sites visited

Date Visited	Number of Sites Visited	AHRS Sites Visited
8/1/2012	2	TLM-00165, TLM-00166
8/2/2012	4	TLM-00199, TLM-00200, TLM-00230, TLM-00257
8/3/2012	3	TLM-00138, TLM-00146, TLM-00229
8/5/2012	3	HEA-00183, HEA-00184, **HEA-00489**
8/6/2012	3	TLM-00049, TLM-00073, TLM-00207
8/7/2012	3	TLM-00246, TLM-00247, **TLM-00284**
8/8/2012	4	TLM-00065, TLM-00074, TLM-00076, TLM-00077
8/9/2012	2	HEA-00176, **HEA-00488**
8/10/2012	3	TLM-00077, TLM-00241, TLM-00242
8/12/2012*	1	TLM-00180

Notes:

1. *Only the morning portion of the day was spent conducting inventory; the latter part of the day was spent testing a high potential area.
2. Sites in **bold** were newly recorded cultural resources in 2012.

Table 5.2-1. List of test areas

Test Area Name	Location (DD.dd)	Study Area Location	Site Vicinity and Description
CH-JMH-001	62.930899, -149.152362	Chulitna Corridor	This is on the southwest-most point of a massive terrace on the east/northeast side of Portage Creek. It is roughly 1.6 km (1 mi.) northeast of the Portage/Thoroughfare confluence at 229°tN. The terrace comes to a narrow point. A grid was laid out along the south facing edge. Five negative test pits were dug to 32, 32, 40, 48 and 52 cmbs respectively.
CH-JMH-002	62.892002, -148.878839	Chulitna Corridor	This area is marked by rolling hills and ridges and was a modeled low potential area. The area is around 4200 fasl and (location description removed to allow public distribution). The low potential area is on a flat terrace or moraine near the base of a talus slope. Four test pits were dug; all were negative.
GO-JMH-001	62.754517, -148.942344	Gold Creek Corridor	The test area is on a terrace, south of the Susitna River ~1.68 km (1 mi.) from RM 168 at 5°tN. The test area is within the GO-010 high potential ellipse. The ellipse is large enough to accommodate approximately a dozen test areas. Two negative test pits were dug to 38 and 54 cmbs respectively.
GO-JMH-002	62.751687, -148.886013	Gold Creek Corridor	This test area is a broad hill slope oriented to the east with a view of the Susitna River and Stephan Lake. This should be tested more in the future. The test area is within GO-009, which is a massive broad ridgeline that spans many hundred meters east to west. Three negative test pits were dug to 32, 51, 52 cmbs respectively.
IM-JMH-002	(location description removed to allow public distribution)	Impoundment Area	The test area is on a terrace (location description removed to allow public distribution), 230 m (754.6 feet) at 345° tN from the active channel. AHRS site TLM-00180 is 87 m (285.4 feet) at 93° tN to the east. One negative test pit was excavated to 40 cmbs.
DE-JMH-005	(location description removed to allow public distribution)	Denali Corridor	Due to AHRS site location error, this positive test area was later determined to be known AHRS site HEA-00248. Positive subsurface tests revealed this site has multiple components.

9. FIGURES

(map with AHRS site locations removed to allow public distribution)

Figure 3-1. Overview map of the Study Area at the time fieldwork was conducted.

(map with AHRS site locations removed to allow public distribution)

Figure 3-2. Overview map of the impoundment Area at the time fieldwork was conducted.

(map with AHRS site locations removed to allow public distribution)

Figure 3-3. Overview map of the Chulitna and Gold Creek corridors at the time fieldwork was conducted.

(map with AHRS site locations removed to allow public distribution)

Figure 3-4. Overview map of the Denali corridor at the time fieldwork was conducted.

(map with AHRS site locations removed to allow public distribution)

Figure 5.3-1. Model area with random points, cultural resources, and APE in black (Alaskamapped: Best Data Layer Mid Resolution Natural Color background).

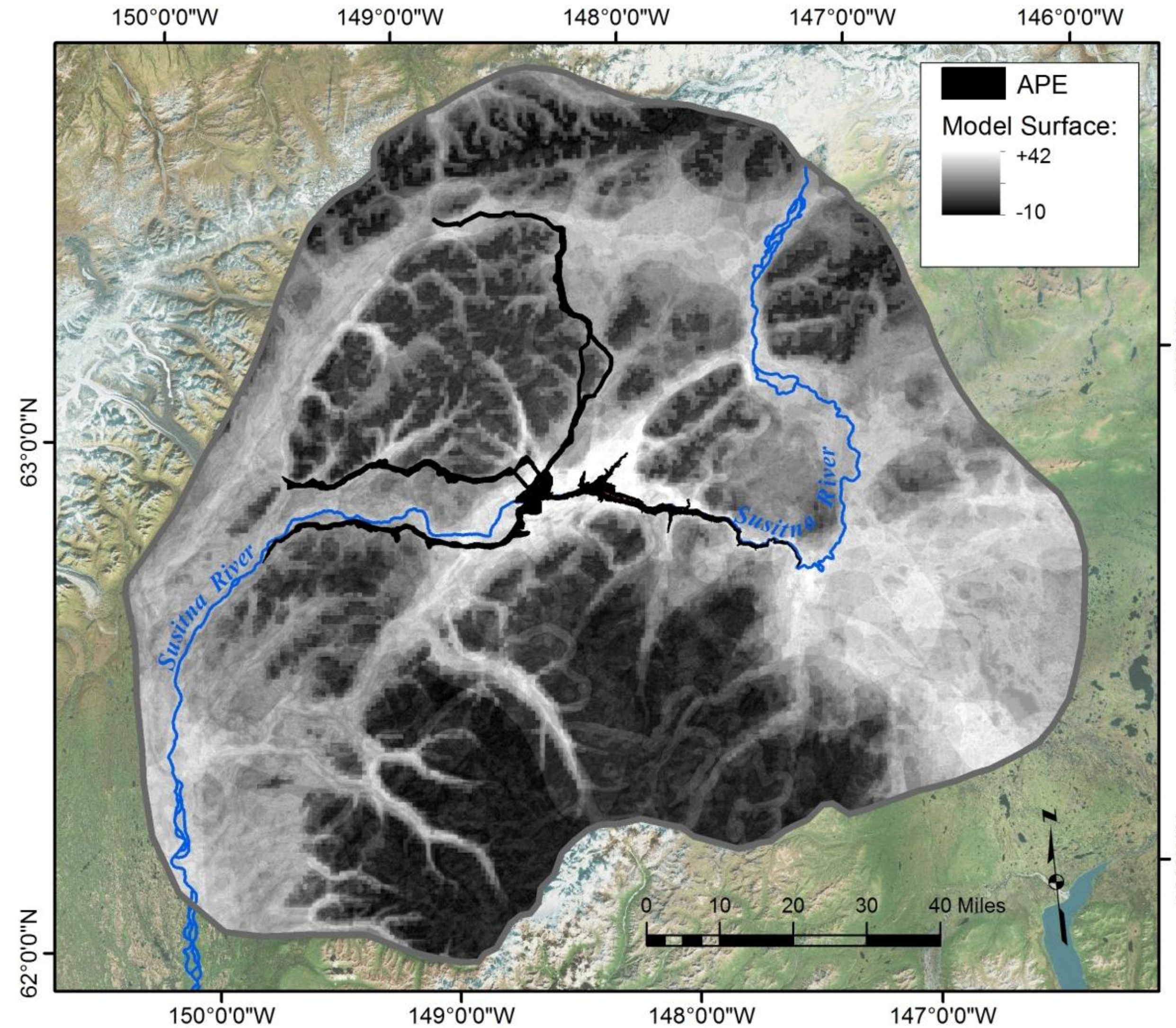

Figure 5.3-2. Cumulative model surface: highest values of +42 (white); lowest values of -10 (black). (Alaskamapped: Best Data Layer Mid Resolution Natural Color background).

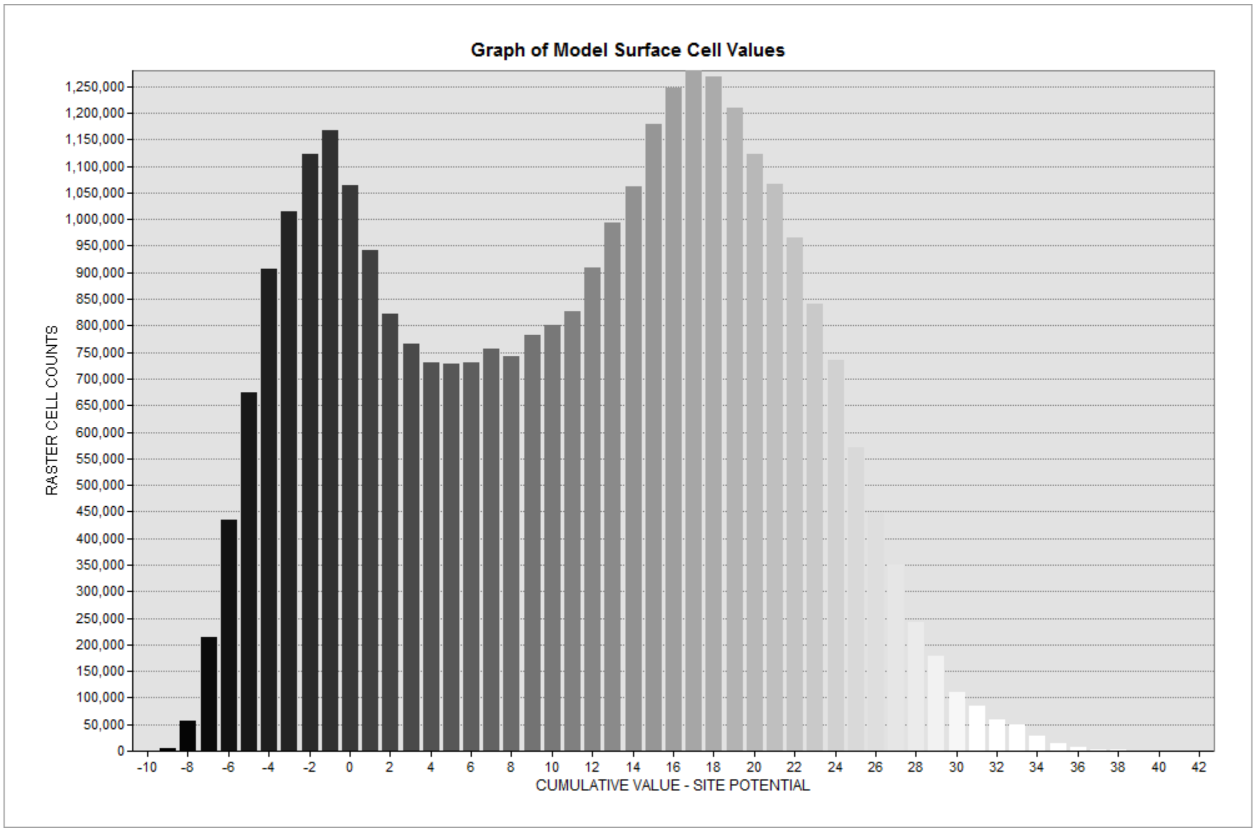

Figure 5.3-3. Cumulative model raster value spread from -10 to +42.

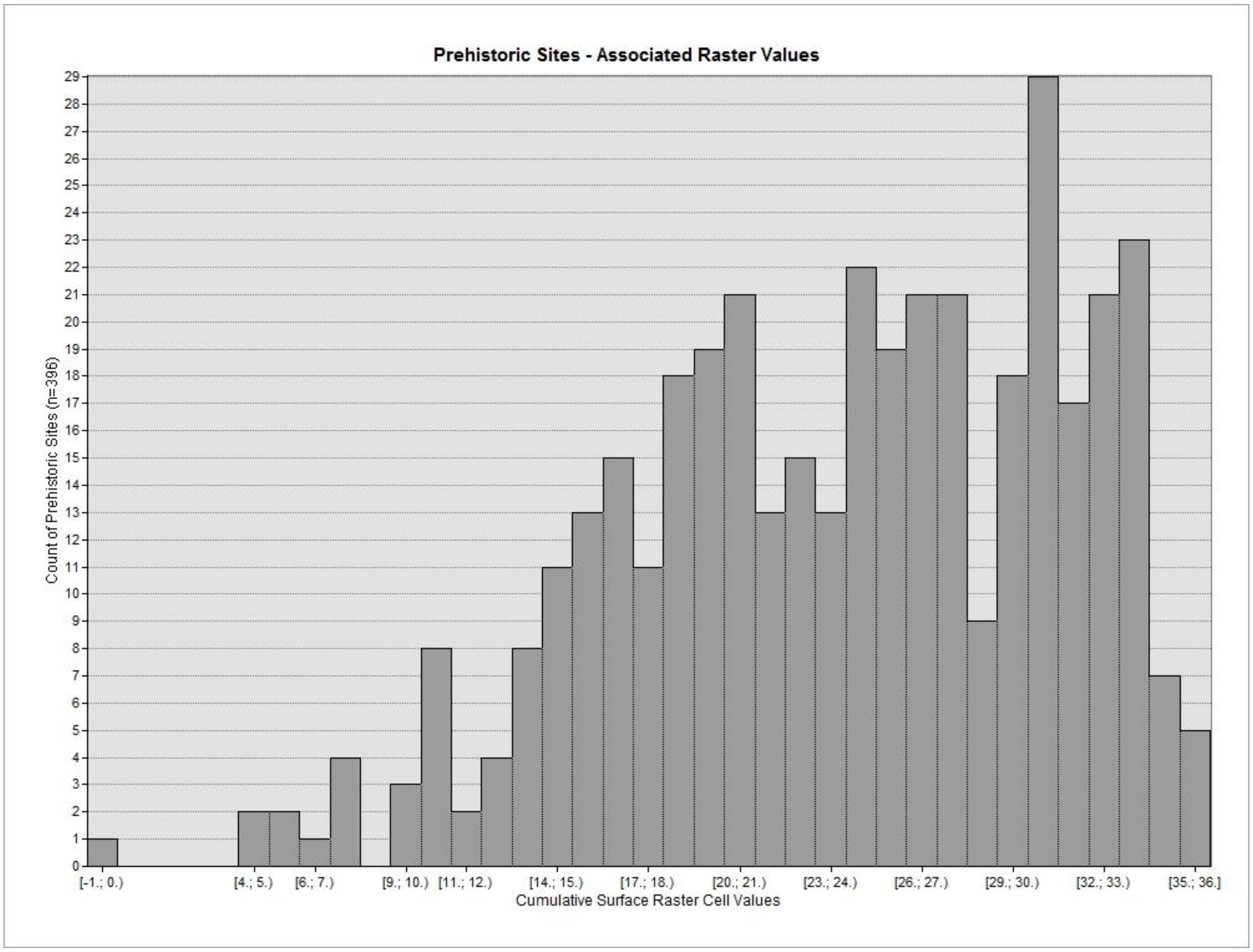

Figure 5.3-4. Prehistoric site dispersion across raster values.

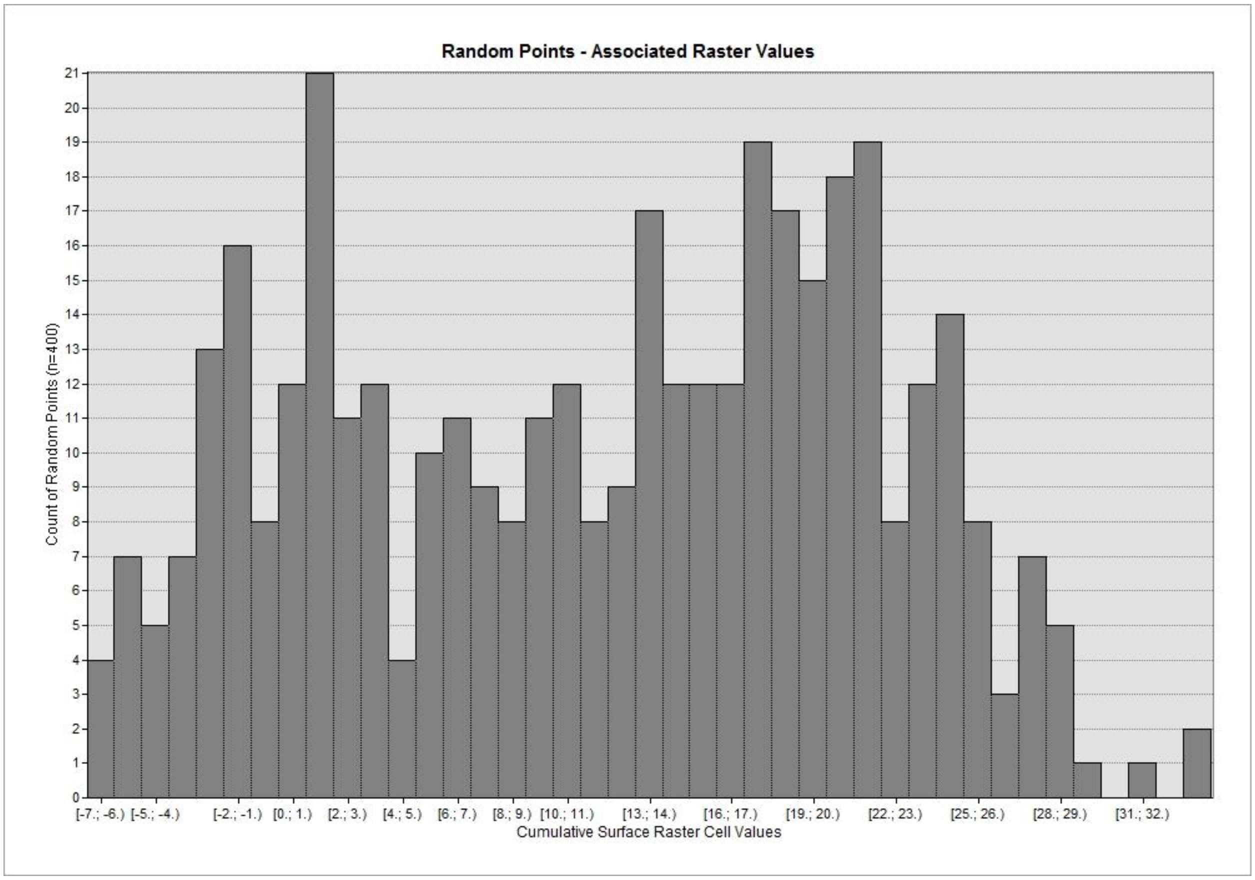

Figure 5.3-5. Random point dispersion across raster values.

Appendix:

Cultural Resources Assessment of 2012 Borehole Sites, for the Susitna-Watana Hydroelectric Project (August 2012)

Introduction

The Alaska Energy Authority (AEA) proposes to drill eight geotechnical boreholes using a helicopter-carried drill rig in mid-July and mid-August 2012 in the vicinity of the proposed Watana Dam site, near the banks of the Upper Susitna River, south-central Alaska. Landing zones (LZs) near the borehole sites were also surveyed because they are very often on flat, level ground surfaces suitable for aircraft landings and slinging cargo. The locations of the eight borehole sites and LZs are shown on Figure 1.

The proposed project falls within lands owned by Tyonek Incorporated. A draft permit application to operate on properties owned by ANCSA organizations, which includes Tyonek, was submitted May 5, 2012 by AEA. Two, one-day cultural resources field surveys were carried out by Northern Land Use Research, Inc. (NLUR) on June 7, and July 1, 2012. NLUR is a subcontractor to URS, a prime contractor to AEA.

This limited assessment is needed to gain concurrence from the Alaska State Historic Preservation Office (SHPO). Because this work is ultimately part of a Federal Energy Regulatory Commission (FERC) licensing process, this assessment is required under Section 106 of the National Historic Preservation Act and implementing regulations in 36 CFR 800.

Methods

The cultural resources survey was conducted as a Phase II or “Evaluation” survey as defined by the Alaska Office of History and Archaeology (OHA) (*Alaska Office of History and Archaeology Historic Preservation Series No. 11, revised 2003*). Such surveys are designed to locate sites in an affected area and gather sufficient information to evaluate the eligibility of sites for listing on the National Register of Historic Places (36 CFR 60).

Archaeological fieldwork included on-the-ground pedestrian survey and aerial survey of the Area of Potential Effect (APE). Standard fieldwork protocols were followed, including photographs, observations of the affected area, surficial geology, slope, soils, and other environmental factors that generally influence the location of cultural resources. The field crew collected Global Positioning System (GPS) points of the surveyed area using a Trimble 6000 Series GeoXT handheld receiver. The measured level of accuracy was +/- 50 cm, uncorrected. Had cultural resources been encountered, they would have been described following standard professional guidelines; however, no artifacts or cultural resources were encountered.

Pre-field Data Review

NLUR’s first task included a literature review of appropriate files and resources pertaining to the Project Area. Most of this material had already been acquired by NLUR as part of the data gap report for AEA (Bowers et al. 2012). NLUR reviewed the Alaska Heritage Resource Survey (AHRS) database managed by the OHA and our own extensive library to assess the archaeological potential and level of previous archaeological investigations that have been conducted in the vicinity of the Project Area (e.g., Dixon 1985; Dixon et al. 1985). AEA provided NLUR with site coordinates of the boreholes and LZs with brief descriptions of each location (Table 1). Slope angle and/or general description were the main criteria used to determine if ground survey was needed. Aerial photographs and topographic maps were also consulted prior to field investigations. Sites: *DH12-1; DH12-2; DH12-5; DH12-7 and LZ; LZ DH12-1 and DH12-2; LZ DH12-5*; and *LZ River, Right Abutment* were selected for potential ground survey for cultural resources.

Cultural Resources Fieldwork

Study Lead Justin M. Hays (NLUR Fairbanks) and archaeologist David Guilfoyle (NLUR Anchorage) met in Talkeetna on June 6. Field work began the following day at the Watana Dam site. Hays and Guilfoyle were able to locate, survey, test (when necessary) and record all of the borehole sites and LZs except for *DH12-5* and *LZ-DH12-5* (Table 1). Borehole *DH12-1* was on a steep slope at 27 degrees on the upper, southern bank of the Susitna. *DH12-2* was on a 24-degree slope, however we dug a test pit in a level area near survey stakes (Figures 2 and 3). The test pit was hand excavated using a folding shovel and trowel. Sediments were screened through a ¼-inch mesh screen. The pit measured roughly 50 × 50 cm and was dug down to bedrock or otherwise culturally sterile sediments. The test pit terminated at an approximate depth of 17 cm. The test pit was backfilled, with the original vegetative mat replaced over the backfilled sediments so that the surface is nearly indistinguishable from surrounding vegetation. *LZ DH12-1, DH12-2* was also in a steep area with standing water. An old LZ, possibly from the 1980s, was recorded. There were recent remains consisting of dimensional lumber, a canvas tarp and an oil can lid (Figure 4). Boreholes *DH12-3*, *DH12-4*, *DH12-8* and the *LZ River, Right Abutment* were confirmed by aerial survey to be on very steep slopes (~30 degrees). *DH12-7* was on an 18-degree slope at the edge of a very steep cliff that drops off to the active channel of the Susitna. Inclement weather precluded the next day's field work. The remaining sites were rescheduled to be surveyed for a later date when helicopter availability would allow access.

The survey resumed on July 1. Hays and archaeological technician Jill Baxter-McIntosh flew to the *DH12-5* site from Talkeetna and were able to locate it from the air (Figure 5). Upon locating the borehole site *DH12-5* we were able to determine that is was unlikely for cultural resources to be impacted by proposed drilling in the flagged location. The borehole site was on the south side of the dam site, on a ledge at approximately 2000 feet above sea level, on a 30-degree slope. The site was flagged with orange flagging. We were able to photograph the borehole site and record a GPS point. The associated *LZ DH12-5* was not flagged or located.

Based on NLUR's 2012 survey, no artifacts, cultural features, human remains, or other cultural resources were encountered at any of the borehole sites or LZs. No cultural materials were reported for this general area by previous investigators (Dixon et al. 1985).

Summary and Recommendation

All of the proposed 2012 borehole sites and LZs were inspected, in addition to reviewing background data, AHRS files, and regional literature. As no cultural resources were encountered, NLUR recommends a finding of *no historic properties affected* (36 CFR 800.4(d)(1)). In our opinion, no further fieldwork is required in advance of the mid-July geotechnical program, and the sites may be considered "cleared" for coring. This report should be submitted to the Alaska SHPO for concurrence and will be incorporated in our final report on the 2012 season.

Table 1. Exploration and Testing Program Work Plan, Provided by AEA to NLUR.

Boring or LZ	General Location	Latitude (°)	Longitude (°)	Northing (ft)	Easting (ft)	Slope Angle (approx)	Clearing Requirements
DH12-1	Left Abutment-Dam	62.820702	-148.537274	3226058	745009	~20° slope	Low-moderate. Scattered black spruce, some alders.
DH12-2	Left Abutment-Dam	62.819918	-148.537913	3225769	744908	~20° slope	Low. Scattered black spruce.
DH12-3	Right Abutment-Dam	62.824229	-148.536609	3227350	745091	~25° upslope, ~35° downslope	Moderate-High. Majority of trees are birch to over 40 feet tall, some spruce.
DH12-4	Right Abutment-Dam	62.823566	-148.538202	3227102	744830	~35-40° slope	Moderate-High. Birch and some spruce, trees to over 40-50 feet tall.
DH12-5	Right Abutment-CM Source	62.821143	-148.526431	3226261	746818	~15° upslope, ~30° downslope	Low-moderate. Dense alder, scattered white spruce and birch to 30-40 feet tall.
DH12-6	Right Abutment-CM Source	62.820567	-148.532055	3226029	745883	~30° slope	Low. Black spruce to 15-20 feet tall, alder.
DH12-7 and LZ	Right Abutment-CM Source	62.822124	-148.522236	3226636	747511	~10° upslope, ~25° downslope	Low. Scattered black spruce.
DH12-8	Left Abutment-River	62.822055	-148.537416	3226552	744974	Generally Flat	None to minor. Site located on river cobbles and boulders. Upslope are alders and birch.

Boring or LZ	General Location	Latitude (°)	Longitude (°)	Northing (ft)	Easting (ft)	Slope Angle (approx)	Clearing Requirements
LZ - DH12-8	River Terrace, Left Abutment	62.822057	-148.539496	3226545	744626	Generally Flat	Low-moderate. Scattered birch and alder.
LZ DH12-3, DH12-4	Midslope on Right Side of Valley (N2 stake)	62.824768	-148.538501	3227540	744770	~20-30° upslope	Moderate-High. White spruce to greater than 50 feet tall, alder.
LZ DH12-1, DH12-2	Midslope LZ on Left Abutment	62.817642	-148.539097	3224933	744729	Flat to low angle (helo already able to shut down)	Low. Less than 20-30 minutes of final clearing of black spruce.
LZ DH12-5	LZ Southeast of Drill Site, Left Abutment	62.820868	-148.525604	3226164	746959	Low angle	Low-moderate. Moderately dense black spruce.
LZ River, Right Abutment	River Terrace, Right Bank	62.823356	-148.536212	3226995	745516	Generally Flat	Low. Clearing logs and alders on river terrace.

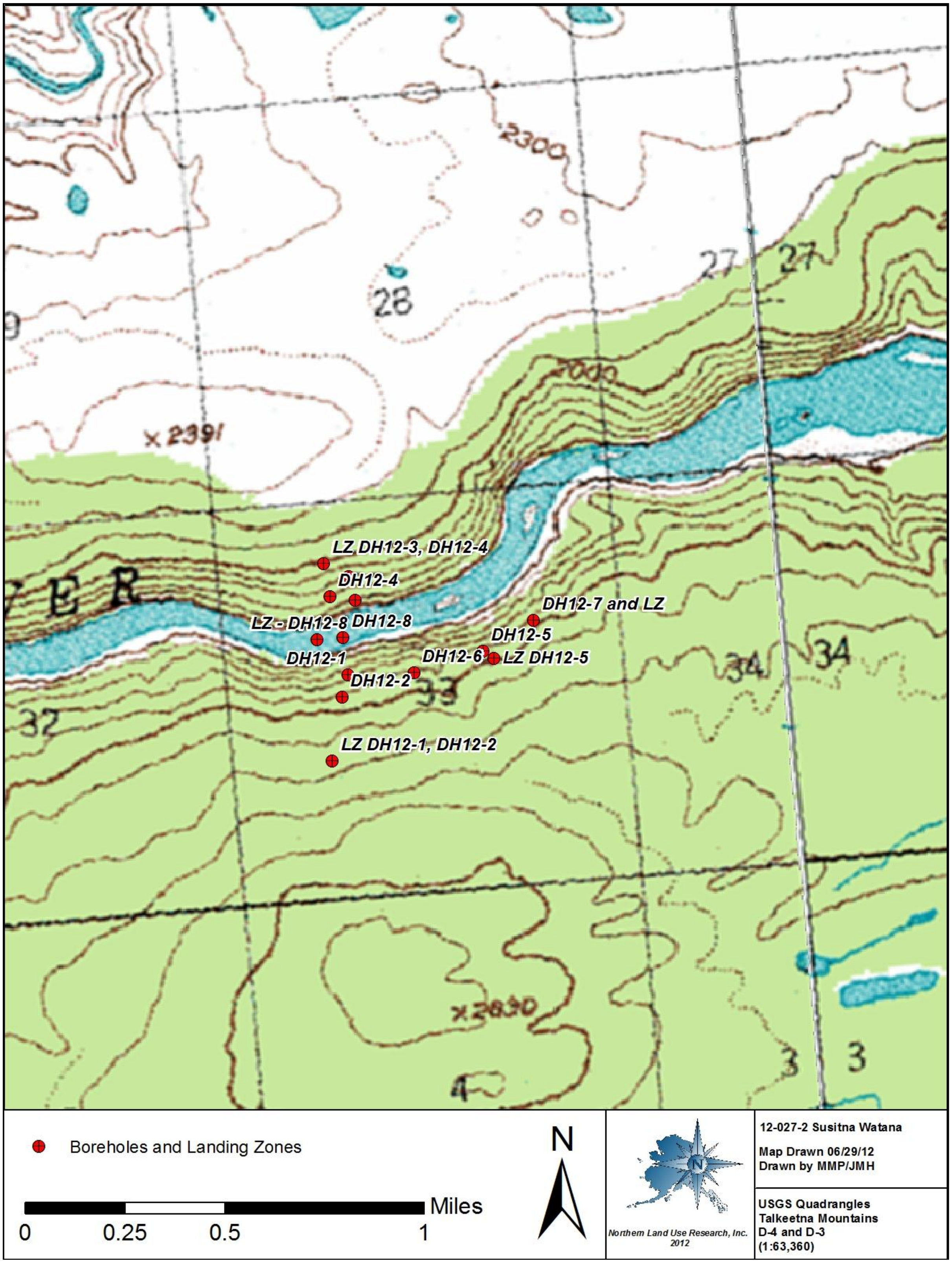

Figure 1. Location map with Borehole Sites and LZs, Talkeetna Mountains (D3 and D4) 1:63,360 scale (USGS base map).

Figure 2. Test pit in near the DH12-2 stake, view to the northeast (NLUR image).

Figure 3. Test pit excavated to bedrock, plan view (NLUR image).

Figure 4. Recent LZ recorded near the DH12-1 site (NLUR image).

Figure 5. Overview aerial photo of *DH12-5* near the bottom center of the image (NLUR image).