CONFIDENTIAL

Proposed Methods for a Phase I Cultural Resources Survey of the Keystone Pipeline Project Corridor, Cushing Extension, Oklahoma Segment, Kay, Noble, and Payne Counties, Oklahoma

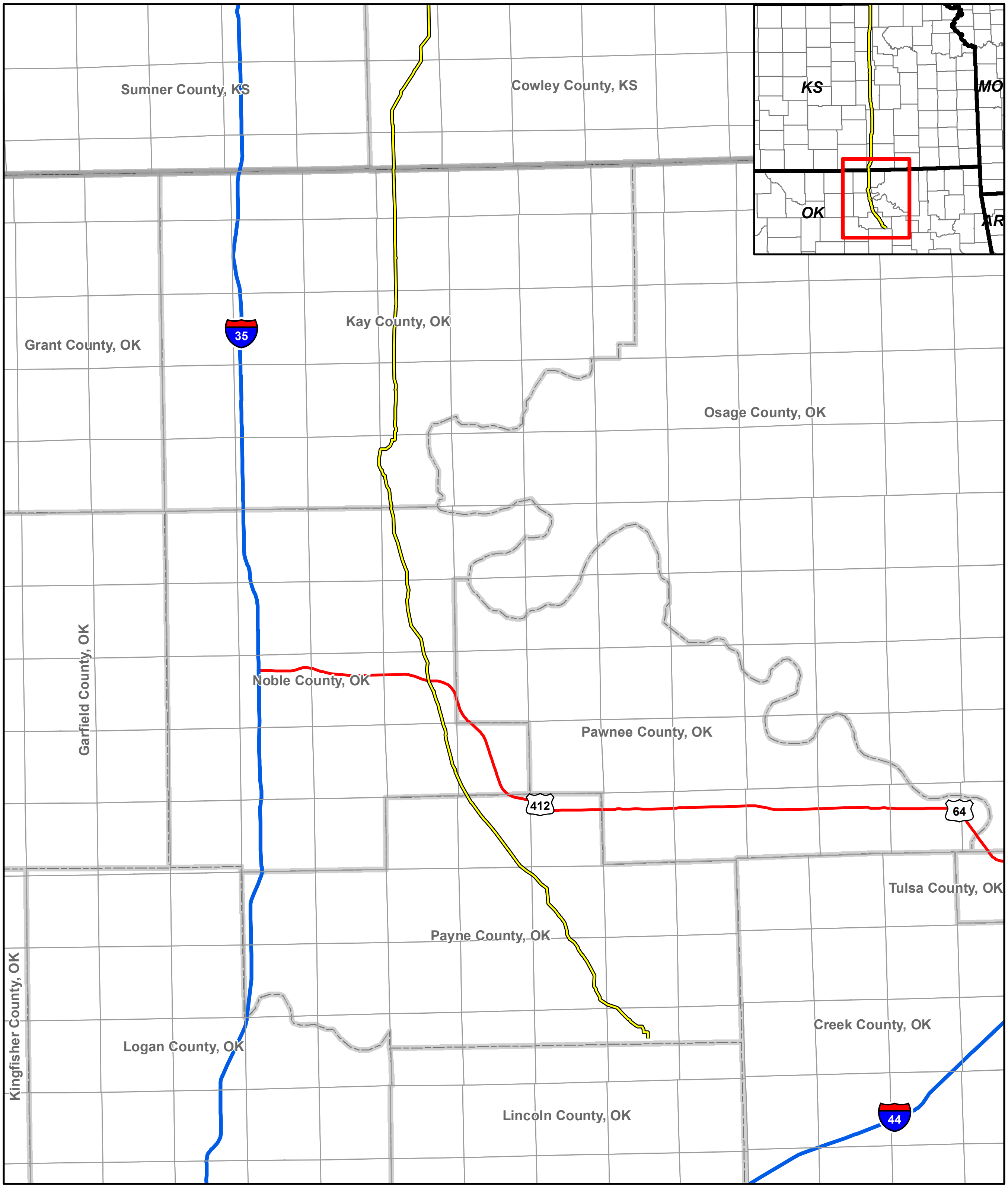
Prepared for
ENSR International
Fort Collins, Colorado

Prepared by
American Resources Group, Ltd.
Carbondale, Illinois

Principal Investigator
Steve Titus

February 2007

CONFIDENTIAL



Legend

Proposed Cushing Extension

Keystone Pipeline Project

Cushing Extension
- Oklahoma -

0 5 10 Miles

1:750,000

N

TABLE OF CONTENTS

Introduction

This document is a response by American Resources Group, Ltd. (ARG), Carbondale, Illinois, to a request by ENSR International, Fort Collins, Colorado, for a research design and methodology for conducting a Phase I cultural resources survey of the Oklahoma Segment of the Keystone Pipeline Project corridor, Cushing Extension. The proposed pipeline corridor passes through three counties in its nearly 79.66-mile transect of north-central Oklahoma (see Figure).

An archaeological investigation of the entire length of the Oklahoma segment of the proposed pipeline corridor will be conducted by ARG to locate and record all cultural resources within the project area and to make a preliminary assessment of their historical significance using National Register of Historic Places (NRHP) criteria (36 CRF 60.6, *Federal Register* 1976). The survey methodology that will be employed is described in the concluding section of the document.

Project Description

The Keystone Pipeline Project is a proposed 1,870-mile-long crude oil pipeline extending from Hardisty, Alberta, to Patoka, Illinois. The Cushing Extension represents a lateral extension of the Keystone Pipeline from a point near the Nebraska-Kansas border to Cushing, Oklahoma. The Cushing Extension of the Keystone Pipeline passes through the north-central Oklahoma counties of Kay, Noble, and Payne. The proposed pipeline corridor enters the state of Oklahoma at Mile Post CE-212.57 and ends at Mile Post CE-292.23, a distance of 79.66 miles.

The Keystone Pipeline will transport heavy crude oil from Alberta, Canada, to markets in the central United States. The pipeline will be a critical aid to the anticipated growth in Canada's crude oil production over the next decade. The project sponsor is TransCanada Corporation. The U.S. Department of State will oversee the project and, as lead agency, coordinate the participation of the other state and federal agencies that must also review relevant parts of the project.

Results of Records Check and Literature Review

A site file search and literature review were conducted by Geo-Marine, Inc. (Carrier Jones and Kuehn 2006). The purpose of the records search and literature review was to determine the nature and extent of archaeological investigations conducted to date in the portions of north-central Oklahoma that the Cushing Extension pipeline traverses and to identify the number and nature of previously recorded sites located within an approximately 1-mile radius of the proposed pipeline.

Previously Recorded Sites and Surveys

The results of the background study indicate that 16 previously recorded sites are located on or within 250 feet of the Oklahoma segment of the Cushing Extension pipeline centerline (Carrier Jones and Kuehn 2006:2–10). An additional 45 sites have been recorded within 1 mile of the proposed pipeline centerline. These 61 previously recorded sites identified in the vicinity of the project corridor include 31 prehistoric sites and 30 historic sites. The majority of these sites have not been evaluated against NRHP criteria, and therefore, no determination of eligibility has been made for these sites. Four of the 16 sites located on or within 250 feet of the proposed pipeline centerline, however, have been assessed as ineligible for inclusion in the NRHP. The 101 Ranch site (site 34KA-318)—though presently located outside of the 250-foot buffer around the pipeline centerline—is listed on the NRHP and should be avoided in any future realignment (Carrier Jones and Kuehn 2006:9). Additional archival research, such as reviewing historic maps and county histories, will also be undertaken prior to, as well as concurrent with archaeological field investigations to determine historic site potential.

Fifty-three professional archaeological surveys have been conducted in the vicinity of the proposed Cushing Extension (Carrier Jones and Kuehn 2006:10). These consist of surveys primarily associated with oil and gas industry construction, tribal government pursuit of federal funds, as well as road alignment, utilities, and waste disposal/landfill areas.

Methodology

The proposed research methodology will consist of a combination of Phase I archaeological field investigations, Phase I geomorphological and geoarchaeological field investigations, and laboratory analyses. The proposed methods will consist of standard archaeological and geomorphological techniques that have been developed in consultation with state archaeologists from the Oklahoma State Historic Preservation Office (SHPO) and Oklahoma Archaeological Survey (OAS).

Archaeological Field Investigations

A comprehensive archaeological field investigation of the Oklahoma segment of the proposed pipeline corridor will be carried out by two four-person crews. The project corridor along the proposed 79.66-mile-long pipeline route will measure 300 feet wide and will be centered on the proposed pipeline centerline. Survey coverage of the project corridor will be accomplished using a variety of field techniques, including systematic surface survey, systematic shovel testing, and systematic walkover survey. These techniques are outlined below.

Systematic Surface Survey. Portions of the project corridor exhibiting ground surface visibility equal to or greater than 10 percent will be investigated through systematic surface survey. Surface survey will be conducted along four parallel transects spaced 20 m apart. Whenever cultural material is found, transect spacing will be collapsed to 10 m, and the entire area will be intensively surveyed in order to determine the extent of the material scatter and to make a collection of artifacts. A sketch map showing the site limits, the survey area boundaries, and any topographic and cultural features that might be used to relocate the site will be prepared for each site recorded.

Systematic Shovel Testing. Portions of the project corridor that are relatively level, but that have less than 10 percent ground surface visibility, will be investigated through systematic shovel testing. Shovel tests will be excavated every 20 m along four parallel transects spaced 20 m apart. Shovel tests are holes approximately 35–45 cm in diameter that are dug to a depth sufficient to observe culturally undisturbed soils. Excavated fill will be hand sorted, and each shovel test will be backfilled after its contents are inspected.

Where positive shovel tests occur or surface features are identified, the interval between tests will be reduced to 10 m as a means of verifying site location or determining the dimensions of the site. A horizontal site boundary will be established through the excavation of two consecutive negative shovel tests on a transect, or when the topography and ground slope indicate the boundary can be logically inferred. Recovered artifacts will be bagged by individual shovel test in order to obtain information on artifact frequency across the site. A sketch map showing the locations of positive and negative shovel tests, the site limits, the survey area boundaries, any topographical and cultural features that might be used to relocate the site, and, in the case of historic sites, the location of visible structural remains, will be prepared for each site recorded.

Systematic Walkover Survey. Systematic walkover survey consists of visual inspection of the ground surface along predetermined transects. This technique will be employed in previously disturbed areas and on steep hill sides where slope dip exceeds 20 percent. Previous investigations have shown that land with slopes greater than 20 percent are unlikely to contain archaeological habitation sites. Thus, intensive shovel testing is not a cost-effective site location technique in areas characterized by steep-side slopes. Visual examination of the ground surface in previously disturbed areas and on steeply sloping ground will be carried out along parallel transects spaced 20 m apart.

Geomorphological Field Methods

The Phase I geomorphological investigation will be conducted by Jeff Anderson, PG, CPG.This work will be performed in accordance with the "Guidelines for Geomorphological Investigation in Support of Archaeological Investigations" established in Iowa during 1992. The purpose of the investigation will be to determine the relative age of the surfaces present within the project corridor and to determine whether buried cultural deposits are present.

The potential of the project corridor to contain buried cultural deposits will be evaluated following a three-step approach. The first step entails a review of the topographic maps of the project corridor to determine those areas that have the potential to contain buried cultural resources; these areas are primarily stream crossings that exhibit environmental and geomorphological characteristics favoring deposition and buried Holocene surfaces. The first step of the proposed three-step procedure has already been completed by Geo-Marine, Inc. (Carrier Jones and Kuehn 2006:11–15), and 13 areas have been selected for geomorphological investigation. Second, those 13 areas identified during the foregoing step will be visited and selected locations, such as alluvial fans, colluvial slopes, and stream terraces, will be tested with a sampling tube. Areas that produce evidence of buried A horizons or buried cultural deposits during the sampling-tube investigations will be further evaluated using backhoe trenching. The techniques that will be employed during the geomorphological investigation are outlined below.

Soil Coring. The soil cores will be taken using a hand-held 1.9-cm "JMC"sampling tube. The soil taken from the sampling tubes will be carefully hand sorted in order to determine whether it contains cultural material. The soil profiles observed in the soil cores will be described following the same procedures as those used to describe the soil profiles observed in the backhoe trench walls (see below). Vegetation, depth to the water table, and core depth will be recorded at each location, and the location of each of the deep-testing trenches will be plotted on the project map.

Deep-Testing Trenches. River valleys and smaller stream valleys that produce evidence of buried A horizons or buried cultural deposits during the sampling-tube investigations will be further evaluated using backhoe trenching. Using a backhoe with a toothless bucket, each trench will be excavated approximately 0.6 m below construction impacts, which will extend to an average depth of approximately 1.8 m below the modern ground surface. One or two walls of each of the deep-testing trenches will be scraped and examined for cultural deposits (described below), and the location of each of the trenches will be recorded.

Soil Descriptions. The walls of each of the deep-testing trenches will be examined, and data relevant to characterizing the observed soils will be recorded. The soil descriptions will include color, texture, structure, consistence, sorting, special features (roots, pores, voids, mottling, gleying, concretions, organics, clay skins), effervescence and/or pH, and horizon boundary. Colors of the deposits will be determined with a Munsell color chart. Soil pH will be determined through the use of a Hellige-Truog soil pH kit, and effervescence will be determined through the application of a weak (14 percent) hydrochloric acid solution. The profiles will be described according to taxonomic nomenclature used in Midwest Quaternary and soils studies. Vegetation, depth to the water table, and core depth will be recorded at each location. Photographic documentation of the investigations using color slide film will be conducted during this procedural step.

Geoarchaeological Field Methods

The primary objective of the geoarchaeological investigation will be to determine whether the buried paleosols identified during the geomorphological investigation do in fact contain cultural material. This objective will be achieved through the systematic examination of the walls of backhoe trenches. This technique is described below.

Trench Wall Troweling. Any buried soil horizons with the potential for being culture bearing that are identified through deep trenching will be investigated by troweling the walls of the trench. Soil horizons such as Ap, A, AB, AE, Ab, and ABb horizons will be troweled, but those that are considered subsurface horizons, e.g., Bt, Bw, C, Btb, Bwb, and Cb horizons, will not be. Where buried cultural material is recovered during the troweling of a backhoe trench wall, the soil profile observable in the trench wall will be mapped. A total collection will be made of all prehistoric artifacts found in the trench walls.

Laboratory Analysis

Following the completion of the field work, all recovered materials will be processed at the laboratory facilities of American Resources Group, Ltd., in Carbondale, Illinois, where they will be washed, sorted, and cataloged. Cultural materials will be identified according to material, manufacture, and function.

Prehistoric Artifact Analysis. After the prehistoric artifacts are washed and cataloged, they will be sorted by raw material type and tool and debris category. Lithic materials from each site will be sorted into one of two broad material categories, chipped stone and ground stone. Chipped-stone artifacts will subsequently be sorted by chert-type category, and will then be sorted into tool and debris categories.

Chert Type Analysis. Chert type identification will be based upon macroscopic inspection of artifacts in conjunction with a comparative collection of geologic samples collected from source areas. All chipped-stone tools and all debitage flakes will be examined. Chert will be sorted into categories on the basis of color, texture, inclusions, and form. Chert types will be quantified by count and weight, with weights rounded to the nearest 0.1 of a gram.

Technological and Functional Analysis. Observations on use wear and morphology will be used to sort chipped-stone tools and debris into categories. The categories will be quantified by count and weight, with weights rounded to the nearest 0.1 of a gram. A 10 x hand lens will be used to examine the edges and surfaces of artifacts in order to accomplish the two goals of the analysis: (1) separate tools from debitage, and (2) place tools into general technological and functional categories. Debitage will be separated into categories on the basis of specific attributes such as amount of dorsal cortex, degree of platform faceting and lipping, flake shape and curvature, and overall size. Tool and debitage analysis will be aided by prior experiments in stone tool production and use. Materials from these experiments are kept on hand for comparative purposes.

Prehistoric Ceramic Analysis. The prehistoric ceramics recovered during the present investigation will be sorted into general categories defined in terms of tempering, exterior surface treatment, relative thickness, and paste color, and recognized type names will be applied where appropriate. The data obtained from the ceramic analysis will be used to assign the occupations represented at the investigated sites to general cultural periods (e.g., Plains Village).

Historic Artifact Analysis. Historic artifacts will be examined and grouped by material, manufacture, and function using established contextual classification categories developed by Stewart-Abernathy (1986) and adapted from previous studies (Sprague 1981; Stone 1974). Production date ranges will be assigned when possible, and tables will be constructed for each site. Establishing the age of an artifact is often complex. Sometimes it represents a stylistic trend, such as the popularity of transfer-printed ceramics during the early to mid-nineteenth century. Other times, a date specifies a technological change, such as the invention of the automatic bottle machine in 1903. Artifact mean dates will be calculated for temporally diagnostic artifacts from each site adapted from South's (1977) formula. A brief description of the four-step process in which historic artifacts will be analyzed follows.

Functional Class. Within each material type (ceramic, glass, metal, construction materials/minerals, or other), historic artifacts will be first separated into functional classes. These functional classes include: (1) household (includes foodways [kitchenwares and tablewares], furnishings, facilities, and maintenance and repair); (2) personal (clothing, health and grooming, adornment, and recreation); (3) built environment (construction material, fencing, hardware, and fasteners); (4) occupational/labor (food acquisition or production [agriculture and hunting/fishing] and craft/trade); (5) exchange (commerce, communication, and transportation); (6) group services (organized social behavior [educational/theological]); and (7) unknown context.

Description/Dating. After separating the artifacts into functional classes, each artifact will be closely analyzed with regard to specific material/ware type, manufacturing method, and decoration. Ceramics will be sorted by paste color, paste texture, glaze, and decorative treatment. Glass artifacts will be sorted by manufacturing method, color, decoration, vessel type, and function. Clear glass will be tested for lead with a shortwave ultraviolet light. Metal objects will be divided by material such as iron, steel, brass, copper, lead, tin, zinc, etc., and, then, by function (e.g., wagon hardware, tools, nails, or cutlery). Construction and other materials/minerals, including brick, mortar, cement, sandstone, limestone, cinders/clinkers, and other minerals will be counted and/or weighed before they will be discarded. Whole or half bricks with sides will be examined to determine manufacturing technique. Once a brief written description is made for each artifact, a general manufacturing/popularity date range will be assigned based upon the analysis and research.

Table Formation. After all of the materials are analyzed, a clear, concise table for each site will be constructed. Two tables will be made for sites with proveniences containing more than 10 shovel tests, one incorporating all artifact data (surface finds and shovel tests) in a single column, and another describing materials in each shovel test. The tables will be arranged primarily by function. Each artifact description will be listed along with its appropriate date range (if known), and all of the columns will be totaled. In the foodways functional class, artifacts will be further separated into material type (ceramic, glass, metal, or modified bone); ceramics will be further distinguished by ware type (whiteware, stoneware, yellowware, etc.). A final sorting of these artifact types will focus on the ways in which these items were used. Glass and ceramic storage vessels such as stoneware crocks and glass Mason jars will be placed in the kitchenwares category, whereas cups and saucers will be assigned to the tablewares class.

Mean Dates. Mean dates will be calculated for each site. Only temporally diagnostic artifacts (with both beginning and ending dates of manufacture/popularity) will be used to compute the mean dates. The mean artifact date will be calculated using a method based on the mean ceramic date formula developed by Stanley South (1977). This procedure involves determining the midpoint between the beginning and ending point of manufacture of a particular artifact type. The midpoint date is multiplied by the number of sherds (artifacts) in the category, the sum of which is then divided by the total number of sherds (artifacts) used in the calculation.

Curation

Archaeological materials collected during the Phase I survey will be temporarily curated at the facilities of ARG in Carbondale, Illinois, allowing for accessibility to materials during artifact analysis and preparation of the technical report. After acceptance of the final report, all artifacts will be returned to the landowner; if the landowner does not want to retain ownership of cultural materials recovered during archaeological investigations of his or her property, then, all artifacts, along with maps, field notes, and other documents will be placed in storage containers and submitted for permanent curation at the Sam Noble Oklahoma Museum of Natural History in Norman, Oklahoma.

Native American Notification

The results of the background study performed by Geo-Marine, Inc. (Carrier Jones and Kuehn 2006:26) indicate that the proposed pipeline route does not pass through land owned by tribal governments. However, the following Native American tribes may have historical interest in the region and should be contacted for inclusion in the Section 106 process:

Caddo Nation
Cherokee Nation
Kaw Nation
Osage Nation
Otoe-Missouria Tribe of Indians, Oklahoma
Iowa Tribe of Oklahoma
Pawnee Nation of Oklahoma
Ponca Tribe of Indians of Oklahoma
Tonkawa Tribe of Indians of Oklahoma
Wichita and Affiliated Tribes

REFERENCES CITED

Carrier Jones, B.M. and D. Kuehn

2006 *Research Design for Cultural Resources Investigations for the Cushing Lateral of the Transcanada Pipeline, Kay, Noble, and Payne Counties, Oklahoma.* Geo-Marine, Inc., Plano, Texas. Ms. on file at American Resources Group, Ltd., Carbondale, Illinois.

Federal Register

1976 *Federal Register*. 36CFR Part 60: Protection of Historic and Cultural Properties ed., vol. 41(6): 1595.

South, S.

1977 *Method and Theory in Historical Archaeology. Academic Press, New York.*

Sprague, R.

1981 A Functional Classification for Artifacts from 19th and 20th Century Historical Sites. *North American Archaeologist* 2(3):251–261.

Stewart-Abernathy, L. C.

1986 *The Moser Farmstead, Independent but Not Isolated: The Archaeology of a Late Nineteenth Century Ozark Farmstead*. Arkansas Archaeological Survey Research Series No. 26. Arkansas Archaeological Survey, Fayettville.

Stone, L. M.

1974 *Fort Michilimackinac 1715–1781, an Archaeological Perspective on the Revolutionary Frontier*. Publications of the Museum, Michigan State University, East Lansing.